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YOUNG (H. E.). **Fused needle disease and its relation to the nutrition of Pinus.**—*Qd For. Bull.* 13, 108 pp., 35 figs., 1 diag., 8 graphs, 1940.

This paper, now reprinted in bulletin form, has already been noticed from another source [*R.A.M.*, xix, p. 682; see also ibid., xx, p. 40].

MOUNCE (IRENE), BIER (J. E.), & NOBLES (MILDRED K.). **A root-rot of Douglas Fir caused by Poria weirii.**—*Canad. J. Res.*, Sect. C, xviii, 10, pp. 522–533, 4 pl., 2 figs., 2 maps, 1940.

A root rot of young Douglas fir (*Pseudotsuga taxifolia*) trees first observed in 1929 at the Cowichan Lake Forest Experiment Station on Vancouver Island, British Columbia, has since been found to occur generally throughout the south-eastern part of the island. It is not yet known to be present on the mainland. A survey of stands in the original area of infection showed the disease to be common in 20- to 40-year-old trees, occurring mainly in patches. In addition the causal organism has been isolated from rot in 100- and 200-year-old trees as well as from western hemlock (*Tsuga heterophylla*). In sample plots established in infection centres in young Douglas fir stands, 32 to 57 per cent. of the trees were found to have been killed by the disease.

The first external symptom of the trouble is a retardation of the growth, usually accompanied by a scanty crop of cones and a gradual thinning of the foliage. A year or two later all the needles turn brown, indicating that the tree is dead. The roots of dead trees are decayed and such trees are often found uprooted with the large roots broken off near the crown. In the transverse section of the stump of a recently killed tree a brownish stain characteristic of the incipient stage of decay is usually present in the heartwood, with numerous patches extending into the sapwood. This discoloration is found for a distance of 4 to 6 ft. in advance of the later stage of decay, which first appears as small separated areas, each traceable back to individual decayed roots. Later the entire central core of the stump is rotted, the wood is soft and flaky, yellowish to brownish, and honeycombed with small pockets, which at first may be filled with whitish fibres, but become empty. The annual rings separate easily, and tufts or sheets of mycelium containing readily visible brown setal hyphae are present between the layers and on the bark of diseased roots and the soil around them. With the exception of the colour of the mycelium, which is sometimes

pale avellaneous, the root rot of the Douglas fir closely resembles that caused by *Poria weirii* in western red cedar (*Thuja plicata*) and the sporophores found on the Douglas fir fundamentally agree with this species. A comparison of the cultural characters of the Douglas fir organism with those of *P. weirii* showed that the only difference was that of colour, *P. weirii* being deep yellow to brown, whereas the Douglas fir organism often exhibits pale avellaneous tones. It is concluded that the Douglas fir organism is either identical with or a form of *P. weirii*.

Armillaria mellea is stated to cause appreciable losses in stands of young Douglas firs on the island, being probably more prevalent in the central parts of it than in the Cowichan Lake region. Although it may cause a reduction in growth, discoloration of needles, and death of trees, it can easily be distinguished from *P. weirii* by the sporophores at the base. In the advanced stages of the decay caused by *A. mellea* the wood becomes light yellow or white, soft and spongy, often stringy, and marked by numerous black zone lines, thus bearing little resemblance to the *P. weirii* rot. Furthermore, in the trees affected by *A. mellea*, the needles turn pale yellowish to yellowish-brown instead of reddish-brown, an abnormal resin flow is usually found at the base of infected trees, veined white mycelial fans are abundant between the bark and wood, and dark brown or black rhizomorphic strands may be present in the cambium, on the surface of diseased roots, and free in the soil.

Berg (A.). **A rust-resistant Red Cedar.**—*Phytopathology*, xxx, 10, pp. 876–888, 1 fig., 1940.

Three grafted red cedar (*Juniperus virginiana*) seedlings, 16D, 66D, and 22X, which had proved resistant, moderately susceptible, and susceptible, respectively, to rust (*Gymnosporangium juniperi-virginianae*) [*R.A.M.*, xx, p. 24] in a 16-year trial at the West Virginia Agricultural Experiment Station, were transplanted to an apple orchard and exposed to four years' infection by the fungus. At the end of this period, the clones from 22X were so heavily infected that all died and those of 66D were severely injured, whereas those of 16D retained their high degree of resistance and would in all probability do so under natural conditions. In view of the traditional popularity of the red cedar in the Shenandoah Valley, where some resentment still prevails against the compulsory eradication of all trees within three miles of a commercial orchard, under a statute dating from 1912, in West Virginia [cf. ibid., v, p. 105], the development of a resistant variety for landscape cultivation would be of commercial value.

Edwards (J. H.). **New treatment method prolongs mine timber life.**—*Coal Age*, xliv, 10, pp. 53–55, 6 figs., 1939.

Seven Alabama coal-mining companies are stated to be now using mine timber treated by the 'osmose' process [*R.A.M.*, xix, p. 181], whereby standard preservative chemicals are mixed with a colloid so that very deep penetration after dipping or brushing green wood is effected by natural means without mechanical pressure or vacuum equipment. Approximate percentages of the constituents are: sodium

fluoride 78, potassium bichromate 3, dinitrophenol 14, and gum arabic 5, the material being supplied in the form of a dry powder and converted into a fluid aqueous paste by the admixture of sufficient water. This wet mixture must be applied to the green timber, an abundance of sap in which assists penetration by osmotic pressure and diffusion, and for at least 30 days after dipping or brushing the wood must be kept piled and covered with waterproof paper to exclude air and so prevent the natural process of drying, a further precaution consisting in the shovelling of earth round the base of the pile. In Dolomite No. 3 mine of the Woodward Iron Co. osmose-treated southern pine [*Pinus* spp.] is being exclusively used for timbering a six-heading aircourse; the 6 in. posts with 24 by 6 by 4 in. caps placed on 4-ft. centres, are treated in the field where they are cut, and the caps and wedges at the saw-mill. The Alabama By-Products Corporation started the application of osmose protection to mine ties, roof timbers, and outdoor structures in 1936, when 1,000 sap pine ties, 6 ft. by 6 in. by 6 in., were treated and installed in Barney mine; no signs of decay were apparent at an inspection of this material in March, 1939. Further applications of the method by the same and other concerns are mentioned.

In 100 and 900 lb. lots the powder costs 50 cents per lb., with transportation charges added from the Buffalo plant of the Osmose Wood Preserving Co. With the recommended $\frac{1}{4}$ lb. powder per cu. ft. of wood, or 21 lb. per 1,000 board ft., the cost of the treatment (including waterproof paper) of 1,000 board ft. is about $11.00.

Referring to the application of the osmose process by railways and public utility services, the writer quotes a paper by E. C. Thompson in *Elect. World*, 1st February 1936, stating that the Alabama Power Co. had treated 600 southern pine poles, 30 to 35 ft. long, since the previous autumn. Sodium fluoride penetration was found, 60 to 90 days after treatment, to have exceeded 2 in. on 16 out of 17 poles examined, and 3 in. in five, depth of impregnation being determined by means of the zirconium-alizarin colour reagent test [loc. cit.]. Since the original application the same company has installed over 1,000 additional poles treated in the same way.

Hyler (J. E.). **Southern treating plants increase life of Southern Pine and hardwoods.**—*Sth. Pwr & Indust.*, lviii, 9, pp. 60–64, 1940. [Abs. in *Chem. Abstr.*, xxxiv, 20, p. 7083, 1940.]

At least 75 major wood-preserving plants are stated to be operating in the southern United States, and an increasing tendency has been observed for railroads and other concerns to install their own plants. The bulk of the wood treated is pine, but hardwoods are coming into more general use. Impregnation is mostly carried out by the Rüping empty-cell process, though the Lowry method is also employed [*R.A.M.*, xix, pp. 180, 632]. Open tanks are still used, but it is doubtful whether they can be made permanently suitable or economical. Creosote is the chief preservative used, dry wood being easily finished in three or four hours, while heavy green stock may require upwards of 48, possibly with the addition of vacuum treatment and steaming if much moisture is present.

Franco (R. M.). **Mancha y seca de las hojas de la Cebolla.** [Onion leaf spot and wilt.]—*Rev. Fac. nac. agron. Colombia*, ii, 6, pp. 609–613, 1 fig., 1940.

On dark carmine, yellow-bordered lesions near the tips and bases of onion foliage affected by purple leaf spot in Colombia (where the disease was first observed by R. A. Toro in 1928), the author found conidia, which he regards as being characteristic of *Alternaria porri* [*R.A.M.*, xvii, p. 654]. The pathogen is stated to be responsible for heavy losses in Santander, where onion cultivation is practised on a commercial scale.

Snyder (W. C.). **White perithecia and the taxonomy of Hypomyces ipomoeae.**—*Mycologia*, xxxii, 5, pp. 646–648, 1940.

Single-spore cultures of a fungus morphologically agreeing with *Fusarium javanicum* obtained from infected *Cucurbita maxima* and vegetable marrow in California (all found experimentally to be highly pathogenic) gave rise after about a month to perithecial primordia which in some cultures were red, and in others white. None of the primordia developed into perithecia. Conidial suspensions from the cultures with white primordia were applied to those bearing red ones, and vice versa, and in less than a week perithecia were developing. The cultures bearing red primordia developed only red perithecia, and those bearing white primordia developed only white perithecia. Both types fell within the limits of *Hypomyces ipomoeae*. Other evidence demonstrated that both were inter-fertile and that the stable colour of the primordium and perithecium was inherited. No intermediate types of perithecial colour developed in any cross, nor did more than one type of primordium appear in any one single-spore culture. As the progeny from both the red and white perithecia were all highly pathogenic on squash, and all were morphologically identical, it was clear that only one fungus was involved. Single-ascospore cultures of the fungus belonged to two sex-reaction groups and could be described as self-sterile, inter-group fertile, intra-group sterile, and hermaphroditic. It was not possible to change either type into the other by means of ageing or applications of acid or alkali. These results emphasize the danger of using colour as a taxonomic character in fruiting structures of perfect fungi.

Su (U. T.) & Seth (L. N.). **Cultivation of the Straw Mushroom.**—*Indian Fmg*, i, 7, pp. 332–333, 2 pl., 1940.

Further information is presented concerning the cultivation of the edible straw mushroom (*Volvaria diplasia*) in Burma [*R.A.M.*, xviii, p. 156]. Beds consisting of 32 bundles of rice straw, 4 ft. long and 10 in. in diameter, steeped in water for 24 hours, and then arranged in four layers of eight bundles each, the ends of four facing one way and four another, are inoculated with spawn grown in bottles on finely chopped rice straw at 35° to 37° C. for three weeks, pieces being distributed round the edges of the two lower layers at a distance of 4 to 5 in. apart and over the whole of the third. The top layer is watered and slightly trampled. The size of the finished bed is about 3½ by 3½ by 2 ft. The beds are watered once daily, morning or evening, and the

mushrooms begin to appear from 15 to 20 days after inoculation, production continuing intermittently for a fortnight or so and averaging 8 lb. per bed. The total cost of making one bed is about 8 annas [9d.], so that a profit of 8 annas per bed will accrue from the sale of the mushrooms at 2 annas per lb. *V. diplasia* can be grown at any time from March to October in localities where the minimum atmospheric temperature does not fall below 70° F.

WANN (F. B.). **Chlorosis of Concord Grapes controlled by grafting : the grafting of Concord scions on vinifera rootstocks produces a Vine that is resistant to chlorosis.**—*Fm Home Sci.*, i, 1, pp. 9, 11, 1 fig., 1940. [Abs. in *Exp. Sta. Rec.*, lxxxiii, 3, p. 357, 1940.]

Proper rooting of the cuttings and cultural care were shown to be important factors in the general vigour and productiveness of Concord vines at the Utah Agricultural Experiment Station in connexion with attempts to combat chlorosis (associated with local deficiency of available iron in the soil) by grafting. The [*Vitis*] *vinifera* varieties were found to remain green and healthy under conditions in which those of the *V. labrusca* group developed the trouble, and a number of the former, including Tokay, Muscat, Malaya, Black Prince, and Rose of Peru, were successfully used as stocks for Concord scions.

CONNERS (I. L.). **Nineteenth Annual Report of the Canadian Plant Disease Survey, 1939.**—xi+112 pp., 1940. [Mimeographed.]

In this report [cf. *R.A.M.*, xviii, p. 724] the author states that during 1939 wheat stem rust (*Puccinia graminis*) was of small importance in Canada. For the first time in ten years the disease was responsible for only minor losses in Manitoba, where 77 per cent. of the wheat acreage was sown to the resistant varieties, Thatcher and Renown, about 18 per cent. to durum wheats, mainly Mindum, and the remainder to Marquis, Ceres, Reward, and other susceptible wheats. As infection was also much less prevalent than usual in the winter wheat areas in the United States, little primary inoculum reached the spring wheat areas in Canada.

Samples of wheat taken from fields selected at random in all the major agricultural soil zones in Manitoba showed on the average 21·9 per cent. of the plants affected by root rot (*Helminthosporium sativum* and *Fusarium* spp.), with an average loss of yield of 7·5 per cent. Slight head blight of wheat and barley occurred in Quebec and the maritime provinces, and of oats in Quebec. The disease, it is thought, may be much more important than these records indicate, the field surveys in question being effected before most of the crop approaches maturity. The fungi most frequently isolated from wheat were species of *Fusarium*, especially *F. graminearum* [*Gibberella saubinetii*], whereas in barley *F. poae* was the chief fungus, though *H. sativum* was also important, and all collections of oats yielded *F. avenaceum*. The fungus most commonly associated with head discoloration of wheat in Quebec and the maritime provinces was *Septoria nodorum*. Yellow leaf blotch (*H. tritici-repentis*) [ibid., xvii, p. 796] reached epidemic proportions over most of the wheat-growing area in Manitoba, and was also recorded from Saskatchewan and Quebec.

Both *S. avenae* [ibid., xiii, p. 184] and *H. avenae* [ibid., xvii, p. 809] occurred simultaneously in many fields of oats in Quebec in the summer of 1939. Halo blight (*Phytomonas* [*Bacterium*] *coronafaciens*) was noted on oats in all three prairie provinces, and was particularly prevalent in Manitoba and northern Saskatchewan. Only a portion of the Manitoba collections showed a distinct chlorotic halo about the lesion, but all yielded typical *Bact. coronafaciens*.

Lucerne bacterial wilt (*P. insidiosa*) [*Aplanobacter insidiosum*: ibid., xvi, p. 589; xviii, p. 258] was destructive in the irrigated regions of southern Alberta. Almost the only lucerne variety grown in Alberta, Grimm, is very susceptible. A new root rot of sweet clover [*Melilotus*], due to *Phytophthora cactorum*, was also noted in Alberta [ibid., xix, p. 708].

A condition affecting mangel for several years past in New Brunswick was shown to be of a virus nature, and transmissible by grafting; it was tentatively identified as curly top. Another condition in the same locality, provisionally referred to as fern-leaf, was also thought to be of a virus nature, but was not successfully transmitted by sap inoculation. Seed of crested wheat grass (*Agropyron cristatum*) from Saskatchewan was affected by smut (*Ustilago hordei*) [ibid., xviii, p. 665], not hitherto recorded on this host in Canada.

Bacterial diseases of beans caused much anxiety. Bacterial blight (*P.* [*Bact.*] *phaseoli*) was reported from Alberta eastward, while halo blight (*P.* [*Bact.*] *medicaginis* var. *phaseolicola*) was prevalent in British Columbia and was reported from Alberta and Manitoba; it was also reported on a sample of 1938 seed from Kitchener, Ontario. Carrots were increasingly affected by aster yellows [ibid., xv, p. 776] and severe infections occurred in New Brunswick and Nova Scotia. Lettuce anthracnose (*Marssonina panattoniana*) [ibid., xviii, p. 569], new to Manitoba, was severe at Brandon and near Winnipeg.

Potato bacterial ring rot (*P. sepedonica*) [*Bact. sepedonicum*: ibid., xix, p. 725] continued to be very serious. It was present in twelve towns in the irrigated areas of Alberta, and was observed for the first time in eastern Ontario, though few cases were recorded in that province. In Quebec the situation was unchanged, but in New Brunswick twice as many fields were affected as in 1938. New outbreaks were noted in Prince Edward Island, and infection was found for the first time in Nova Scotia, in one field only.

Curly top (virus), long known on tomatoes and other plants in Canada, was recorded for the first time on scattered potato plants, the disease being observed in the Okanagan Valley, British Columbia. *Phoma destructiva* was reported for the first time as a destructive rot of tomatoes in Canada, causing serious damage in a field in Ontario. A *Typhula* rot, known for some years in pit-stored turnips in British Columbia, was ascribed to *T. umbrina* [ibid., xix, p. 434].

STOREY (H. H.). **Plant pathology.**—*Rep. E. Afr. agric. Res. Sta., 1939*, pp. 8–11, 1940.

In this report [cf. *R.A.M.*, xviii, p. 727], the author states that his studies at Amani have shown that cassava mosaic [ibid., xix, p. 579] is caused by a group of virus strains of varying virulence [ibid., xviii,

p. 373]. The same host is also affected by another, and quite distinct virus disease, not hitherto recognized. This the author names 'brown streak' [ibid., xviii, pp. 373, 574]. The mosaic vector at Amani was found to be a species of *Bemisia* [ibid., xviii, p. 231; xix, p. 580]. Breeding work for resistance to both diseases was begun at Kizugu substation in 1938, and among the varieties under test there was a wide range of resistance both to mosaic and brown streak. The hybrid material obtained has given promising results.

Further work in 1939 confirmed the high resistance to maize streak of certain lines of the Peruvian Yellow Flint variety [ibid., xviii, p. 727], and attempts are being made to breed a commercial type from them.

In connexion with work on the virus disease of passion fruit reported from Kenya [woodiness: ibid., xix, p. 664] a large collection of seed of *Passiflora* spp. has been made.

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, li, 10, pp. 559–562, 3 figs., 1940.

Club root (*Plasmodiophora brassicae*) [*R.A.M.*, xix, pp. 130, 356, 509] of crucifers has been present in New South Wales for at least 45 years, but has not yet spread to all the localities where cabbages and cauliflowers are grown. Every precaution should be taken to ensure that infection is not introduced into these areas. Only clean seed-bed soil should be used; doubtfully clean soil should be sterilized by heat or chemical treatment. Where seedlings are transplanted into infected land, the site which each plant is to occupy should be treated immediately before transplanting with ½ pt. mercuric chloride solution (1 in 2,000). In some cases applications of not less than 2 tons of hydrated lime per acre to infested soil will reduce infection.

For many years ornamental plants in New South Wales have shown a condition referred to as 'greening', marked by an excessive production of leafy structures instead of normal petals in the flower heads. Sometimes only a few heads on a plant are affected, the others remaining normal. Plants commonly showing the condition include marigold [*Calendula officinalis*], Iceland poppy [*Papaver nudicaule*], phlox, snapdragon [*Antirrhinum majus*], aster [*Callistephus chinensis*], and sunflower. The cause of the condition has not yet been ascertained, but the symptoms suggest a virus origin.

Sclerotinia minor was recorded on lettuce for the first time in New South Wales in August, 1940.

Agricultural research in New Hampshire. Annual Report of the Director of New Hampshire Agriculture Experiment Station for the year 1939.—*Bull. N.H. agric. Exp. Sta.* 319, 46 pp., 1940.

The following items of phytopathological interest occur in the Botany and Horticulture sections of this report (pp. 26–30 and 37-9). The results of O. R. Butler's experiments on apple scab [*Venturia inaequalis*] control with flotation sulphur paste (16 lb. per 100 gals.) indicated that three cover sprays (involving a supplementary treatment between the pink and calyx) did not give materially better results than two. Lime-sulphur solution is commonly believed to 'burn out' scab, but this was

not the case in the present trials, the fungus being observed to sporulate freely round the edges of the dead infected tissues.

A. F. Yeager's experiments in the substitution of mild sulphurs for lime-sulphur in scab control gave promising results, provided the former were of sufficient fineness and purity. Where excessive damage from the disease was anticipated, however, the use of lime-sulphur proved most effectual.

S. Dunn's records, covering the past eight years, afford no evidence of any correlation between the duration of the snow cover and the date of the commencement of apple scab ascospore discharge. In only three of the eight years did this process begin later than the regular date of application of the pre-pink spray, and in two of these discharge started very shortly after, namely, five and six days in 1933 and 1935, respectively. Only in 1939 would it have been practicable to omit the pre-pink spray on the basis of the ascospore discharge data.

In a comparative test on the effect of mulching on the incidence of bitter pit in apples [*R.A.M.*, xix, p. 604], leaf samples from mulched trees were found to contain more extractable potassium than non-mulched. The latter, however, produced a higher percentage of large apples in 1939. There was very little bitter pit, 0·5 and 0·03 per cent., in the fruit from the mulched trees and non-mulched, respectively. In storage the apples from mulched and non-mulched trees developed 8·62 and 3·36 per cent. disease, respectively.

Boron-sprayed apple trees were found by H. P. Latimer to drop less fruit than the untreated. Cork spot [ibid., xix, pp. 603, 659] was satisfactorily combated by the use of boron either in spray or fertilizer form. Borax applications as low as 5 lb. per acre caused a trace of leaf scorch in strawberries, increasing to severe damage at 80 lb.

Science for the farmer.—*Rep. Pa agric. Exp. Sta., 1939–40* (*Bull.* 399), 76 pp., 14 figs., 1 diag., 3 graphs, 1940.

The following items of phytopathological interest occur in this report [*R.A.M.*, xix, p. 200]. Twenty-nine high-yielding varieties of oats resistant to smut [*Ustilago avenae* and *U. kolleri*] (of which the five most promising are from a cross of Albion and Red Rust-proof) have been isolated by C. F. Noll from hybrids bred by him and varieties developed by the United States Department of Agriculture. In inoculation experiments the highest average infection on any of these varieties was 6·5 per cent. compared with 61 per cent. on the standard variety Patterson. C. J. Irvin reports that over a seven-year period the percentage of smutted plants resulting from inoculation ranged from 0·4 to 9 in six resistant selections, as compared with 65·1 and 17·8 for Patterson and Cornellian, respectively. The results of trials conducted by E. L. Nixon showed that two applications of sprays (usually Bordeaux mixture) made very early were more important in controlling late blight of potatoes [*Phytophthora infestans*] than two applications just before or at the time of the first appearance of the disease. A new material, cuprocide 54 Y (yellow cuprocide), was found to be a promising substitute for Bordeaux mixture.

W. S. Beach does not accept J. J. Reid and D. E. Haley's view that tobacco wildfire is caused by a physiological adaptation of the common soil saprophyte, *Pseudomonas fluorescens* [ibid., xviii, p. 764; xix, p. 48].

H. W. Thurston, Jr., and D. E. H. Frear analysed 30 samples of commercial brands and home-boiled concentrates of lime-sulphur, and found a high degree of correlation between specific gravity and polysulphide content. The importance is stressed of diluting the concentrate so as to produce a given specific gravity after dilution.

In laboratory tests conducted by C. C. Wernham, marked differences were found to exist in the susceptibility of various strains of grass, propagated by seed, to a species of *Helminthosporium* causing the 'melting-out' disease. Kentucky bluegrass [*Poa pratensis*] proved highly resistant if not immune, but timothy [*Phleum pratense*] was very susceptible. There was some evidence indicating that there may be differences in the pathogenicity of different strains of the fungus. Where the annual bluegrass, *Poa annua*, constitutes a high percentage of the turf, the attacks of the disease are stated to have been severe, particularly around Philadelphia.

Observations by W. S. Beach indicate that in addition to excess dampness and soil acidity, abundance of organic matter in the casing soil and injury caused by other organisms predispose mushrooms to attacks by *Trichoderma* spp. [ibid., xix, p. 201]. Maintenance of optimum conditions for mushroom growth in the beds is, therefore, recommended. Two species of *Diplocladium* [ibid., xiii, p. 14] were proved to be responsible for decay of mushrooms similar to that caused by *Dactylium dendroides* [ibid., xviii, p. 779], but the spread was less rapid and the damage caused was less serious.

In tests conducted by J. W. Sinden, good mushroom composts neither suffered nor benefited by the addition of gypsum [ibid., xix, p. 326] and superphosphate. Composts with excess water, on the other hand, were made to produce a crop by the addition of gypsum.

FAWCETT (G. L.). **Departamento de Botánica y Fitopatología.** *Ex* **Memoria anual del año 1939.** [Department of Botany and Phytopathology. *Ex* Annual Report for the year 1939.]—*Rev. industr. agríc. Tucumán*, xxx, 1–3, pp. 44–49, 1 fig., 1940.

The following items of interest occur in this report of the Department of Botany and Phytopathology, Tucuman [cf. *R.A.M.*, xix, p. 8]. Chlorosis of sugar-cane [ibid., xviii, p. 327] continues to attract the chief attention of growers. There is no evidence of the implication of any toxic agency in the soil, faulty nutrition being probably at the root of the trouble.

Three years' experiments in the transmission of psorosis from diseased to healthy oranges by means of *Aphis gossypii* having given negative results, it is concluded that infection is not disseminated in this manner. *Septoria* [*citri*] on the pomelo [ibid., xix, p. 8] was well controlled by spraying with Bordeaux mixture. This fruit was widely affected by chlorosis due to zinc deficiency [ibid., xvii, p. 520].

An unidentified tobacco virus, almost as destructive as that of 'corcova' [hunchback], which has been absent during the last two years, is engaging the writer's attention. Downy mildew (*Peronospora tabacina*) was observed for the first time in Argentina, destroying numerous seedlings in excessively shaded plantations.

Potatoes were attacked by *Phytophthora infestans* and 'verruga'

[presumably wart disease: *Synchytrium endobioticum*, apparently a new record for the Argentine]. The use of certified seed from Buenos Aires has contributed to a reduction in the incidence of virus disorders.

No insect vector of the serious virus disease of beets causing the growth of buds in the leaf axils [ibid., xviii, p. 328] has yet been detected. The same host is subject to spring infection by a form of mosaic, experimentally shown to be transmissible by *Myzus persicae*.

TEMPLEMAN (W. G.) & MARMOY (C. J., *née* TOWNEND). **The effect upon the growth of plants of watering with solutions of plant-growth substances and of seed dressings containing these materials.**—*Ann. appl. Biol.*, xxvii, 4, pp. 453–471, 1940.

The results of experiments carried out at Jealott's Hill Research Station (Imperial Chemical Industries Ltd.) showed that seed treatment with dressings of talc, agrosan G, or granosan plus α-naphthylacetic acid or β-indolylacetic acid in concentrations ranging from 0·01 to 1·0 per cent. failed to stimulate the germination, tillering, growth in height, or the dry matter production of oats, barley, sugar beet, or wheat grown in sand and soil in pots, or of wheat and oats grown in small-scale field experiments. Solutions of sodium α-naphthylacetate alone produced no increase in plant height or amount of dry matter in lettuce, white mustard, and tomato, except in one or two isolated instances [*R.A.M.*, xix, p. 322].

CHRISTENSEN (J. J.) & DAVIES (F. R.). **Variation in Helminthosporium sativum induced by a toxic substance produced by Bacillus mesentericus.**—*Phytopathology*, xxx, 12, pp. 1017–1033, 4 figs., 1940.

Isolates of *Bacillus mesentericus*, cultured on artificial liquid or solid media, produced a substance that suppressed growth, increased conidial development, inhibited or retarded germination, caused abnormal hyphal growth, and induced mutation in certain races of *Helminthosporium sativum* [*R.A.M.*, vi, p. 473; xvi, p. 525], of which race 1 was studied in detail. Inhibition of the growth of the fungus, but no sectoring, resulted when the two organisms were grown in close association. Malt, maize meal, and oatmeal agars were the best of the media tested for the production by *H. sativum* of variants in the presence of the bacterial toxin; variation was also affected by the concentration of the toxic substance. In general, potato dextrose agar containing 2 to 3 per cent. of the bacterium-staled broth yielded the maximum number of sectors and the greatest number of varying types.

The bacterial substance was found to be thermostable, diffusible, and capable of passage through a Berkefeld filter; it was readily adsorbed on infusorial earth, withstood freezing and desiccation, did not deteriorate appreciably during several months' standing, and was tolerant of acid, though succumbing to treatment with an alkali and being destroyed or partially inactivated by contact with *Coniothyrium*, *Dematium*, *Penicillium*, and *Cephalosporium* spp., and *Botrytis cinerea*.

Sterilized broth cultures of *Bacillus mesentericus*, added to the substrata of various fungi, suppressed the growth of the latter but did not increase the incidence of sectoring, except in the case of *H. sativum* and possibly one species of *Penicillium*, denoting a considerable degree of specificity of the toxic substance to the cereal pathogen. Even races

and variants of *H. sativum* responded diversely to the toxic influence of the bacterium. Race 1 of the fungus, growing on potato dextrose agar, gave rise to numerous variants differing from the parent culture in cultural characters, general physiology, pathogenicity, and (to some extent) morphology. Of 12 such variants a few were more virulent to wheat and barley than the parent strain, others somewhat less so, and still others virtually non-parasitic. By means of mutation *H. sativum* became adapted to a new environment, thereby simulating an accession of tolerance to the toxic substance engendered by *B. mesentericus*.

PAINTER (R. H.), JONES (E. T.), JOHNSTON (C. O.), & PARKER (J. H.). **Transference of Hessian fly resistance and other characteristics of Marquillo Spring Wheat to Winter Wheat.**—*Tech. Bull. Kans. agric. Exp. Sta.* 49, 55 pp., 8 figs., 1 diag., 9 graphs, 1940.

In a series of breeding experiments carried out in two localities in Kansas and in one in Missouri from 1932 to 1937 on the transference of resistance to Hessian fly, *Phytophaga destructor* (Say), from Marquillo spring wheat to winter wheat, the reactions of the progeny were also noted towards stem and leaf rusts [*Puccinia graminis* and *P. triticina*], bunt (*Tilletia levis*) [*T. foetens*], and mildew (*Erysiphe graminis*). Selections from the family 35 FN 742, Marquillo × Oro, combined resistance to Hessian fly with high resistance to all four diseases. Selection 35 FN 743, Marquillo × Oro, which produced the best agronomic types, was not quite equal to the foregoing in resistance to *P. graminis*, the reactions of the different lines ranging from moderate resistance to susceptibility; most of the lines were resistant to the other diseases under investigation. Nearly all the lines comprising selection 35 FN 677, Marquillo × Tenmarq. are practically equal to the latter in resistance to *P. triticina*, but only moderately resistant to *P. graminis* and fairly susceptible to mildew. The reactions of the fly-resistant selection, 35 FN 660, Marquillo × Tenmarq, to disease were not quite so promising as those of the other families, infection by *P. triticina* ranging from 10 to 30 and by *P. graminis* from 60 to 90 per cent., while all but two lines were susceptible to mildew.

The behaviour in respect of insect and disease infestation of each of the six generations involved in the investigation is fully discussed and the statistical data presented in tabular form.

HEALD (F. D.) & HOLTON (C. S.). **Flag smut of Wheat found in Washington.**—*Plant Dis. Reptr*, xxiv, 19, p. 382, 1940. [Mimeographed.]

Two collections of flag smut (*Urocystis tritici*) were made independently in August, 1940, from Hymar wheat on a farm at Goldendale, Washington, a small field of Rose wheat on the same farm also being affected. The percentage of infection in different parts of the fields ranged from 0 to 25, with an estimated average of 5. Four infected Hymar plants were also found two miles south of Goldendale.

SANFORD (G. B.) & CORMACK (M. W.). **Variability in association effects of other soil fungi on the virulence of Helminthosporium sativum on Wheat seedlings.**—*Canad. J. Res.*, Sect. C, xviii, 11, pp. 562–565, 1940.

A preliminary account is given of experiments (begun in 1933)

made under pure culture conditions to demonstrate the antagonism displayed by 24 isolates of *Penicillium* spp., 8 of *Actinomyces* spp., and several other miscellaneous soil-inhabiting fungi to the pathogenicity of *Helminthosporium sativum* on wheat seedlings.

The [tabulated] results showed that when the *Penicillium* isolates were associated with *H. sativum*, the virulence of the latter ranged from 16 to 97 per cent., as compared with 73 per cent. for *H. sativum* alone. *P. simplicissimum* and *P. fuscum* reduced this rating by 57 and 42 per cent., respectively. Of two isolates of *P. chrysogenum*, one depressed virulence by 39 per cent., while the other increased it by 20 per cent. One isolate of *P. expansum* depressed virulence by 31 per cent., while two others had virtually no effect. One isolate of *P. glabrum* and two of *P. terrestre* depressed virulence by 24, 18, and 11 per cent., respectively. *P. trzebinskii* had no effect, and *P. rugulosum* increased virulence by 22 per cent. Of four isolates of *P. viridicatum*, two reduced virulence by 22 and 17 per cent., respectively, one had no effect, and the fourth increased virulence by 11 per cent. One isolate of *P. chloroleucon* depressed virulence by 17 per cent., while another had no effect. Two isolates of *P. cyclopium* had no effect. Of the four remaining unidentified species of *P.*, one depressed virulence by 11 per cent., two had no effect, and one increased virulence.

In comparison with a disease rating of 66 per cent. for *H. sativum*, four isolates of *Actinomyces* depressed virulence by 33, 22, 22, and 11 per cent., respectively, two had no conspicuous effect, and two increased it by 12 and 16 per cent., respectively.

Among the miscellaneous fungi an isolate of *Trichoderma viride* reduced the infection rating by 58 per cent., two of *T. lignorum* [*T. viride*] reducing it by 56 and 50 per cent., respectively. An isolate of *Absidia glauca* reduced infection by 39 per cent., and one of *Aspergillus nidulans* by 30 per cent. Other fungi tested appeared to exert no influence on virulence.

It is concluded that within a given species some isolates may exert no effect on the virulence of a pathogen, while others may depress it, and yet others increase it.

Brandwein (P. F.). **Infection studies on the covered smut of Oats.**—*Bull. Torrey bot. Cl.*, lxvii, 8, pp. 673–691, 1940.

The writer's technique for the inoculation of oats with covered smut (*Ustilago levis*) [*U. kolleri*] and the germination and planting of the seedlings has already been described [*R.A.M.*, xviii, p. 243]. In order to determine the effective periods of infection, batches of seed and seedlings of three varieties representing different categories of susceptibility were inoculated every six hours with dry chlamydospores of race 7 of the fungus with the following results. The highly resistant Markton showed 2·7 and 1·9 per cent. infection at the zero and 18-hour stages (from time of planting), respectively, but was immune thereafter, Black Mesdag (partially susceptible to race 7 of the smut) developed 70·9 and 85·5 per cent. infection at zero and six hours, respectively, the incidence falling to 8·7 at 60 hours; while the highly susceptible Monarch contracted 100 per cent. infection throughout the 0- to 30-hour period, with a decline to 4·9, 2·1, and 1·9 per cent. 96, 102, and 126 hours,

respectively, after planting. The periods of effective infection for Monarch and Black Mesdag were limited to the first 132 and 100 hours, respectively, and the periods of maximum infection were calculated to fall between 36 and 72 and 36 and 54 hours, respectively, after planting, the highly susceptible variety having a longer period of infection and a longer effective period of maximum infection than the partially susceptible. During the effective periods of infection the growth rates of the seedlings of the three test varieties were remarkably uniform, increasing between 48 and 96 hours after planting (a period of rapidly diminishing infection percentages) some 480 per cent. over the rate during the first 48 hours. The resistance of Markton, which in the light of these data cannot be explained on the basis of growth rate, is tentatively attributed to the existence of a specific internal factor unfavourable to the development of the smut, inoculation with which, under the controlled environment of these studies, exerted no adverse effect on the resistant host.

Regional infection experiments on Monarch seedlings showed that, though the smut may penetrate the mesocotyl and develop therein, no sporulation results. The maximum incidence of sporulating infection appears to succeed the invasion of the coleoptile.

Three sets of factors would appear to be operative in the relationship between *U. kolleri* and its host, namely, a specific internal factor analysable on a genetic basis, environmental conditions, and a growth factor, the first-named governing true resistance and the other two the incidence and extent of infection in susceptible seedlings. The use of the following definitions is suggested with a view to simplifying the discussion of systemic infection by *U. levis*: (*a*) seedling invasion, occurring in both susceptible and resistant varieties and not necessarily terminating in sporulation; (*b*) non-sporulating 'latent' or 'blasting' infection [ibid., xii, p. 209; xvii, p. 451]; and (*c*) sporulating infection, expressed by the fruiting of the fungus in the reproductive organs of the host.

McNew (G. L.) & Braun (A. C.). **Agglutination test applied to strains of Phytomonas stewarti.**—*Bot. Gaz.*, cii, 1, pp. 64-77, 1940.

In studies [which are fully described] made to identify by means of the agglutination test 90 single colony isolates of *Phytomonas* [*Aplanobacter*] *stewarti* [*R.A.M.*, xix, p. 694] obtained from 27 naturally infected maize plants growing in fields at Princeton, New Jersey, three isolates failed to agglutinate in the two sera employed, some agglutinated in one or other but not both, and the remainder agglutinated in both at dilutions of 1:20 to 1:2,560. In all, 15 strains were studied. No consistent difference was observed in the serological properties of isolates from susceptible and resistant inbred lines. Some isolates from the same leaf lesion differed as widely as others from different plants.

Strains from the same culture differed in serological characters, which were not correlated with any particular colony characteristic, physiological ability, or degree of virulence. Strains from various places in the United States and Mexico differed no more from one another than did some variants from one strain. Some of the strains agglutinated in all sera and usually at the high titres of 1:1,280 to 1:5,120. These strongly

agglutinating strains generally induced immune sera that failed to agglutinate five of the strains, while poorly agglutinating strains gave sera effective against every culture tested. Several other species of wilt-producing bacteria failed to agglutinate in anti-serum for three strains of *A. stewarti*.

The results obtained show that the agglutination test has limitations when applied to *A. stewarti*. In making agglutination tests for the identification of cultures more than one serum would have to be used, and even the failure of a strain to agglutinate would not be evidence that it was not a strain of *A. stewarti*. There would appear, however, to be no valid reason why agglutination in immune serum for *A. stewarti* should not be accepted as evidence that the strain belongs to the species. Apparently the serological characters of *A. stewarti* change very easily, and the ability of this organism to produce new types probably explains the presence of serologically distinct strains in the same leaf lesion.

Mitchell (H. H.) & Beadles (Jessie R.). **The impairment in nutritive value of Corn grain damaged by specific fungi.**—*J. agric. Res.*, lxi, 2, pp. 135–141, 1940.

In experiments carried out in Illinois the infection of maize with *Diplodia zeae* and *Fusarium moniliforme* [*Gibberella fujikuroi*: cf. *R.A.M.*, x, p. 180] definitely impaired the digestibility of the contained nitrogen and energy and the nutritive value of the protein and energy for the promotion of growth in the rat. Damage done by *G. fujikuroi* may be more severe than that by *D. zeae*. The fungi changed the chemical composition of the maize, causing above all a marked loss in ether-extractable constituents. Maize infected with *G. saubinetii* to the extent of 53 per cent. diseased kernels proved to be extremely toxic to young albino rats, so that too little was eaten to permit a fair test of its effect on the maize protein.

Fawcett (H. S.) & Bitancourt (A. A.). **Observações sôbre as doenças dos Citrus no Paraguai.** [Observations on Citrus diseases in Paraguay.]—*Biológico*, vi, 10, pp. 289–296, 1940. [English summary.]

The major diseases of citrus observed in the Asunción region of Paraguay during a tour of inspection in April, 1937, were foot rot (*Phytophthora* spp., including *P. parasitica*), isolated from rotted lemons; a very severe form of leprosis [*R.A.M.*, xviii, p. 101; xix, p. 85] involving the branches, leaves, and fruit, affected oranges being much defaced by numerous sunken, black, annular lesions; sweet orange scab (*Elsinoe australis*) [ibid., xix, pp. 341, 366] on sweet and bitter oranges, lemons, and tangerines, believed to have long been established in Paraguay (the presence of the bitter orange pathogen, *E. fawcetti*, in the country is regarded as doubtful); psorosis (mild attacks only) and a disorder of lemons known as 'concave gum disease' ('Citrus diseases and their control', 2nd edition, 1936, pp. 215–216), shown by the first-named author to be due to a virus allied to that responsible for psorosis; crotch disease of tangerines, characterized by the formation of cankers in the crotches, and having some analogies with bark rot in the East;

and false canker [loc. cit., p. 245] of lime, rough and common lemons, and citron (also observed on bitter orange in the province of Corrientes, Argentine Republic).

Of minor importance are melanose (*Diaporthe citri*), stem-end rot (*Diplodia* [? *natalensis*]), *Diplodia* and *Fusarium* rot of tangerines, lemon anthracnose (*Gloeosporium limetticolum*, not to be confused with *Colletotrichum gloeosporioides*), foliocellosis, greasy spot or false melanose [*R.A.M.* vi, p. 359], *Alternaria*, anthracnose (*C. gloeosporioides*), and brown rot of lemons, stylar end rot of Tahiti limes, mesophyll collapse, generally attributed to defective nutritional and water supplies, algal leaf and bark spot (*Cephaleuros mycoidea*), and 'felts' (*Septobasidium* spp. [cf. ibid. xx, p. 13].

MINZ (G.). **Early diagnosis of Jaffa Orange blemishes and diseases by means of ultra-violet rays.**—Reprinted from *Palest. J. Bot.*, R Ser., iii, 1–2, 4 pp., 1940.

When Jaffa oranges were exposed to ultra-violet rays emitted by a 'Philora' lamp (type HPW 57202E/70 120W, produced by Messrs. Philips) [cf. *R.A.M.*, xvii, p. 702] it was observed that in healthy fruits the flavedo and white albedo gave, respectively, an amparo purple and a pale amparo purple fluorescence. In fruits affected with stem-end rot (*Diplodia* [*natalensis*]) or green mould (*Penicillium digitatum*) [ibid., xx, p. 13] the flavedo showed a martius yellow fluorescence, while the albedo was amparo blue. In fruits affected with stem-end rot the flavedo ceased to emit fluorescence when it turned brown to the naked eye, as did the albedo when turning light brown. When oranges artificially inoculated with *D. natalensis* or *P. digitatum* were exposed, no optical changes became apparent during the incubation period, but fluorescence began when the fruits had somewhat softened.

Fissures and punctures gave a 'clear dull green-yellow' fluorescence. Deep pox (nooksan) [ibid., xix, p. 88] and hail spots gave a deep lavender fluorescence. Superficial pox (nooksan) was deep lavender, sometimes with clear dull green-yellow spots. Oleocellosis [ibid., xviii, p. 307] appeared as clear dull green-yellow spots, and pressure spots were oural green to clear dull green-yellow.

Other experiments showed that the ethereal oil obtained by puncturing, extraction, or pressure gave a clear dull green-yellow fluorescence, while fresh ethereal oil expressed and filtered through filter paper was pale viridine yellow, the residue being calliste green.

It is assumed that the distinct fluorescence of injured, blemished, and diseased fruit is due to the presence of ethereal oil. Ultra-violet lamps may perhaps be of value in detecting fruit blemishes, but not fruit rots.

BRITON-JONES (H. R.). **The diseases of the Coconut Palm.**—xvi+176, pp., 37 pl. (1 col.), 1 diag., 2 graphs, London, Baillière, Tindall & Cox, 1940. 10*s.* 6*d.*

The manuscript of this book, completed only a short time before the author's death in November, 1936, has been revised and brought up to date by E. E. Cheesman. Valuable information, intended primarily for growers and agricultural officers with limited research and library

facilities, is presented in a simple and readable form on the 'bud rot' complex (chapter I); bronze leaf wilt (II); *Phytophthora* bud rot (III); tapering stem wilt or pencil point disease (IV); red ring disease (V); false wilt and lightning strike (VI); the stem-bleeding disease (VII); root diseases (VIII); leaf diseases (IX); and gumming disease and dropping of nuts (X).

Among other problems to which the writer devoted personal attention was that of the etiology and control of bronze leaf wilt [*R.A.M.*, xvii, p. 390]. Drought is believed to be the chief immediate cause of the disorder, which is responsible for heavier losses in Trinidad than all the other diseases together. It may be combated partly by effective drainage, but more drastically, where the gravity of the situation demands such a step, by the timely felling of every other palm in a bearing plantation in order to prolong the life of the remainder. Thanks to the ease with which mortality from the disease can now be predicted some years before the fatal stage is reached, this method of elimination has been greatly simplified, but it stills remains to be seen whether it is economical.

Observations in Trinidad, Jamaica, and other West Indian islands led to the conclusion that Ashby's 'leaf-bitten' disease complex [ibid., xv, p. 136] is merely the expression of different phases of non-fatal infection by *Phytophthora palmivora*, *Thielaviopsis* [*Ceratostomella*] *paradoxa* being a secondary parasite on moribund tissue and the yeast a pure saprophyte. The intensity of little or bitten leaf depends on the height in the crown at which *P. palmivora* occurs, the severity of infection increasing from the upper to the lower range and culminating in bud rot proper, entailing the destruction of the buds. Both the bitten-leaf condition and complete recovery from bud rot are common in Trinidad in palms over five years old. Control of *P. palmivora* should consist in cutting down the palm at ground-level and making a pile of the sectioned stem and crown in such a way as to bring the soft rotting tissue of the 'cabbage' and young leaves to the bottom of the pile.

Tapering stem wilt or 'pencil point' may be associated with a variety of adverse environmental conditions involving the starvation of the plant, an important contributory cause in Trinidad having been the protracted drought of 1926, while continuous soil erosion [ibid., xvi, p. 670] along the coast is another factor to be taken into consideration.

A 16-page bibliography is appended.

WEINDLING (R.). **Sodium hypochlorite shows promise as a seed treatment.**—*Phytopathology*, xxx, 12, pp. 1051–1052, 1 fig., 1940.

Very satisfactory control of damping-off (*Glomerella gossypii*) on heavily infested cotton seed [*R.A.M.*, xx, p. 14] was secured in recent tests at the South Carolina Agricultural Experiment Station by treatment with sodium hypochlorite, used either as a dust at the rate of 1½ to 4 oz. per bush. or in the form of a solution consisting of 150 gm. B-K (a commercial preparation of the compound) in 1,000 c.c. water and containing 6 per cent. available chlorine. The results of the spray treatment were somewhat superior to those obtained with the dust, which approached in efficacy the present standard treatment with new improved ceresan.

Miller (P. R.) & Weindling (R.). **A survey of Cotton boll rot diseases in 1940 and the microorganisms connected with them.**—*Plant Dis. Reptr*, xxiv, 20, pp. 417–423, 2 maps, 1940. [Mimeographed.]

The extensive distribution of *Glomerella gossypii* in the cotton belt east of Texas and Oklahoma was again the outstanding feature of the co-operative survey of boll diseases directed by the authors in 1940 [*R.A.M.*, xx, p. 14]. The pathogen was present in only 11·1 per cent. of the Texas, Oklahoma, and New Mexico samples as against 89·6 for all others. In contrast to the previous year, however, no gradual decline of infection westward through Louisiana and Arkansas was registered, possibly owing to the prevalence of favourable climatic conditions for the disease in the south, indicated by its occurrence in nearly 100 per cent. of the Mississippi samples. *Alternaria* spp. came next in order of frequency. The fact that *Phytomonas* [*Bacterium*] *malvacearum* was isolated from green, water-soaked spots on the bolls in the Texas, Oklahoma, and South Carolina samples, in some, but not all, of which *G. gossypii* was also present, is interpreted as pointing to the origination of the lesions by the bacterium, the anthracnose fungus and others entering as secondary invaders. In Mississippi, however, the samples showed few water-soaked spots but abundant infection by *G. gossypii*, the exact mode and period of ingress of which must therefore be left open pending further investigations.

Richardson (A. S.). **Report of the Director of Agriculture.**—*Rep. Dep. Agric. Nyasald, 1939*, pp. 3–11, 1940.

In this report it is stated that cotton production throughout Nyasaland fell heavily in 1939 as a result of weather conditions favouring boll rot (*Bacterium malvacearum*) [*R.A.M.*, xix, pp. 533, 701]. In some areas the disease virtually destroyed the main crop.

Blank (L. M.). **The susceptibility of Cotton seedlings to Phymatotrichum omnivorum.**—*Phytopathology*, xxx, 12, pp. 1033–1041, 1 graph, 1940.

Inoculation experiments were performed at the Texas Agricultural Experiment Station with sclerotia of *Phymatotrichum omnivorum* [*R.A.M.*, xix, p. 702] on Rogers Acala cotton seedlings raised in metal cans in Houston black clay soil with the moisture adjusted to 27, 36, and 45 per cent. of the water-holding capacity and the temperature regulated to 80° to 85° F., a range known to be favourable to the host and parasite. The infection of older (36 days) cotton seedlings was heavier and developed more rapidly than that of younger ones (28 and 21 days). Statistical analyses showed that the two higher soil moisture groups did not differ significantly in the amount of disease produced, which considerably exceeded that occurring in the drier soil. In another experiment the final percentage of root rot eventually rose to over 90 per cent. in all three age groups (10, 20, or 30 days after planting), whereas in seedlings inoculated at the time of planting no symptoms appeared until 31 days later and only affected 25 per cent. of the stand at 48 days. Symptoms appeared more quickly in the 30-day age group than in the 20- or 10-day groups.

The accumulation of carbohydrates in the seedling tissues, roughly coinciding with a sharp increase in susceptibility to infection by *P. omnivorum*, indicates the importance of the nutritional relationship between the host and its parasite. The admixture of starch (½ per cent. or more) with an agar medium or autoclaved soil (1½ per cent. by moist weight) enhanced the virulence of the fungus to such a degree that seedlings inoculated immediately after germination readily contracted infection.

Dutky (S. R.). **Two new spore-forming bacteria causing milky diseases of Japanese Beetle larvae.**—*J. agric. Res.*, lxi, 1, pp. 57–68, 6 figs., 1940.

Full descriptions are given of two new spore-forming bacteria, *Bacillus popiliae* n.sp. and *B. lentimorbus* n.sp., parasitic on the larvae of Japanese beetles (*Popilia japonica*) at the New Jersey Agricultural Experiment Station, the former organism being responsible for the milky disease proper and the latter for type B, in which the overwintered larvae turn muddy brown instead of milky white.

Tate (P.). **On Mycetosporidium jacksonae n.sp. parasitic in species of Sitona weevils.**— *Parasitology*, xxxii, 4, pp. 462–469, 2 pl., 1940.

A full description [without a Latin diagnosis] is given of *Mycetosporidium jacksonae* n.sp., first observed by Miss D. Jackson in 1928 in the gut and malpighian tubules of *Sitona* weevils. The life-history of the organism, the systematic position of which is obscure, comprises vacuolated and compact plasmodia giving rise to spherical, multinucleate bodies; sporulation results in the formation, within thin-walled sporangia, of 8-nucleate, biconvex spores with densely staining, resistant walls. Other types of multiplication consist in the development direct from the plasmodia of small, uninucleate, fusiform bodies, and of the production, within each chamber of a multilocular sporangium, of four to six small, uninucleate, ovoid or fusiform elements.

Flatla (J. L.). **Ringorm hos Ræv.** [Ringworm in Foxes.]—*Skand. Vet-Tidskr.*, xxix, pp. 753–780, 28 figs., 1939. [English summary.]

An account is given of the author's comparative experimental and cultural studies on ringworm in the silver fox and among cattle in Norway, the fungus implicated in the former case being *Trichophyton gypseum asteroides* [*T. mentagrophytes: R.A.M.*, xix, p. 215] and in the latter *T. faviforme album* [*T. album*: ibid., xvii, p. 599]. In one instance *T. album* was found to be not only viable, but still pathogenic, in skin scrapings kept for four years. The cattle fungus is only mildly pathogenic to foxes, the rarity of ringworm among which is readily explained by their specific reaction to *T. mentagrophytes* alone.

Carpano (M.). **Sulla splenomegalia micotica. (Interessante caso di splenite ifomicetica in un giovane Agnello da Asteroides splenicus ovis n.s.).** [On mycotic splenomegaly. (An interesting case of hyphomycetic splenitis in a young Lamb due to *Asteroides splenicus ovis* n.sp.).]—*Riv. mil. Med. vet.*, iii, 1, pp. 1–15, 4 figs., 1940. [English summary.]

The existence of primary mycotic splenomegaly has hitherto been a

debatable problem [*R.A.M.*, xii, p. 445 *et passim*], but the writer claims to have obtained evidence of the involvement of a new species (ad interim) of *Asteroides* (a genus of the Microsiphonales erected by Puntoni and Leonardi: *R.C. Accad. Lincei.*, xx, p. 468, 1934), *A. splenicus ovis*, in the causation of the disease in a lamb in Albania. The organism proved to be non-pathogenic to laboratory animals and non-cultivable on artificial media. It is characterized by elongated, undulating, sometimes curved hyphae, up to over 100 by 1 to 2 μ, composed of bacilliform, rectangular segments becoming progressively shorter towards each extremity and terminating in cubical or polyhedral elements.

Da Fonseca (O.) & De Arêa Leão (A. E.). **Agente etiologico da doença de Lobo.** [The etiological agent of Lobo's disease.]—*Rev. méd.-cirurg. Brasil, 1940.* p. 7. 1940. [Abs. in *Bol. Ofic. sanit. pan-amer.*, xix, 10, p. 1015, 1940.]

Portuguese and Latin diagnoses are given of *Glenosporella loboi* da Fonseca & de Arêa Leão n.sp., the agent of a blastomycotic granulomatous disease of man, originally described by Prof. J. Lobo from Recife, Brazil, in 1933.

Goldberg (L. H.). **Torula infection of the central nervous system.**—*J. Lab. clin. Med.*, xxvi, 2, pp. 299–301, 1940.

Particulars are given of a fatal case of infection of the central nervous system in a 19-year-old girl at Nyack, New York, by *Torula histolytica* [*Debaryomyces neoformans*: *R.A.M.*, xx, p. 61]. In a personal communication to the writer, R. G. Magruder advised that, where the fungus is suspected, a drop of sediment from centrifuged spinal fluid should be mixed with a drop of Greenthal's stain on a slide and examined under a cover glass. The stain will clearly distinguish the nuclei and cytoplasm of the usual cells from the fungal elements, which show a definite cellulose-like wall, surrounded by a wide bluish or purplish capsule. The diagnosis should be confirmed by culture, in which the organism generally reproduces by budding only and does not ferment sugar.

Beeler (R. C.), Collins (J. N.), & Loehr (W. M.). **The roentgenological aspects of pulmonary mycotic infection.**—*J. Indiana med. Ass.*, xxxiii, 11, pp. 613–616, 4 figs., 1940.

Following a brief survey of the mycology, pathology, and clinical features of the bronchomycoses associated, *inter alia*, with coccidioidal granuloma [*Coccidioides immitis*], *Monilia* [*Candida*], and torulosis [*? Debaryomyces neoformans*], the writers enumerate the roentgenological manifestations pointing towards a diagnosis of fungous disease of the lung [*R.A.M.*, xx, p. 61]. Observations at Indianapolis emphasize (*a*) the close similarity of this group of diseases to tuberculosis, both clinically and roentgenologically, (*b*) the utility of X-ray examinations, no matter how inconclusive or difficult they may be to interpret as long as they promote a bacteriological study of the causal organism, and (*c*) the possibilities of satisfactory therapy consequent on early diagnosis. The co-operation of practising physicians, pathologists, and roentgenologists is required in a more diligent search for the bronchomycoses.

De Almeida (F.) & Lacaz (C. da S.). **Processos pulmonares mixtos, com especial referencia á associação tuberculo-micotica.** [Mixed pulmonary processes, with special reference to the tuberculo-mycotic association.] -*Ann. paulist. Med. Cirurg.*, xxxix, 5, pp. 357–364, 1 fig., 1 graph, 1940. [English summary.]

Of 488 specimens of sputum examined at the Faculty of Medicine, University of São Paulo, 20 (4·09 per cent.) were found to contain mixtures of *Mycobacterium tuberculosis* and various fungi, including species of *Actinomyces*, *Torulopsis*, *Rhodotorula*, and *Paracoccidioides brasiliensis* [*R.A.M.*, xix, p. 537]. The intervention of the last-named resulted in a rapid and fatal termination of the disease. The percentage of cultures giving rise to fungi alone in the above-mentioned series of cases was 33·6.

Liston (W. G.) & Cruickshank (L. G.). **On thrush, with special reference to vaginal thrush.**—*Edinb. med. J.*, N.S. (iv), xlvii, 6, pp. 369–390, 4 figs., 1 graph, 1940.

This is a comprehensive survey of the historical, taxonomic, morphological, cultural, and clinical aspects of thrush (*Oidium* [*Candida*] *albicans*), with special reference to the vaginal form, based on the examination of 49 cases. Discussing the nomenclature of the causal organism, the authors plead for the retention of the long-established name, *O. albicans*. Much importance is attached to the hydrogen-ion reactions of the pathogen, the mean P_H reading of the vaginal samples in 32 of the patients under observation being 4·4.

Baltzan (D. M.). **Bronchomoniliasis in Saskatchewan.**—*Canad. med. Ass. J.*, xliii, 3, pp. 224–228, 6 figs., 1940.

Details are given of two cases of bronchomoniliasis, both in men, associated with unidentified species of *Monilia* [*Candida*], this being apparently the first record of the disease for Canada.

Laffer (N. C.). **A note on Saccharomyces fragilis Jørgensen associated with pathologic conditions in human beings.**—*J. Lab. clin. Med.*, xxvi, 2, pp. 294–296, 1940.

Details are given of the writer's cultural study at the University of Arizona on an organism isolated by H. Miller from the throat of a male patient suffering from acute tonsillar infection and classified as *Candida pseudotropicalis* (A study of pathogenic yeasts. Doctor's Dissertation, University of Illinois, 1936). This is regarded by Diddens and Lodder [*R.A.M.*, xviii, p. 525] as the imperfect stage of *Saccharomyces fragilis*. The culture produces one to four ascospores per ascus on carrot blocks or carrot infusion agar after three days or more at room temperature. The examination of colonies on malt extract agar streak plates showed pseudomycelia penetrating the substratum, with the groupings of the blastospores at the junction of the adjoining elements similar to those of the control culture of *S. fragilis* Jorgensen from the Lister Institute. After 24 hours in malt extract broth the cells, which are mostly rod-shaped, measure 6 to 10 by 3 to 5 μ, and the few filamentous 12 to 21 μ in length. The biochemical changes produced by the throat culture and *S. fragilis* were the same, viz., acid and gas in glucose, fructose,

galactose, mannose, lactose, and inulin, and the former only in raffinose; litmus milk turned acid, with evidence of gas production, after a few days at room temperature, and curdled at 37° C.; there was no true liquefaction of gelatine, but softening occurred after 42 days at 18° to 25°.

This is the third case to be reported of human infection by *S. fragilis*, which was named *S. cavernicula* by Redaelli in 1925 and *Monilia pinoysimilis* var. *citelliana* by the same author and Ciferri in 1935. Its prevalence in milk products would explain its location in the throat.

Bolaños (L.). **Costa Rica.**—*Rev. méd. Costa Rica, 1940*, p. 182, 1940. [Abs. in *Bol. Ofic. sanit. pan-amer.*, xix, 10, p. 1016, 1940.]

The following mycoses were observed in Costa Rica: ringworm of the scalp (*Microsporon lanosum*) in four children and a doctor, probably due to the importation of infected animals; numerous trichophytoses; one case of pulmonary and two of abdominal actinomycoses; and one each of sporotrichosis and pulmonary aspergillosis.

Casals (A.). **Tricomicosis en Cuba.** [Trichomycosis in Cuba.]—*Rev. méd. cubana*, xl, p. 1087, 1939. [Abs. in *Bol. Ofic. sanit. pan-amer.*, xix, 10, p. 1016, 1940.]

The majority of Cuban ringworms have been found to be caused by *Microsporon felineum* (33 cases investigated), only one each of *Trichophyton violaceum*, *T. acuminatum*, and *T. rosaceum* having been observed. *M. felineum* was also responsible for four cases of kerion.

Emmons (C. W.). **The isolation and pathogenicity of Pityrosporum ovale.**—*Publ. Hlth Rep. Wash.*, lv, 29, pp. 1306–1312, 1 pl., 1940.

Pityrosporum ovale [*R.A.M.*, xix, p. 94] is stated to have been repeatedly and easily isolated from the scalps of patients with seborrhoea or dandruff by planting untreated scales in dextrose broth (P_H 5·5) with the addition of 23 to 44 per cent. glycerine, the cultures being incubated at 30° to 37° C. Subcultures were made by grinding some of the primary culture with broth in a mortar and pipetting on to previously prepared agar slants. No experimental evidence of pathogenicity of the fungus could be obtained, and it is consequently regarded as a saprophyte, particularly well adapted to growth on the skin, but not concerned in the etiology of the associated disorder.

Scotti (G.) & Tripodi (P.). **Sopra un caso di pitiriasi versicolore acromizzante.** [On a case of achromatic pityriasis versicolor.]—*Rif. med.*, lvi, 16, pp. 506–510, 513, 5 figs., 1940.

Malassezia furfur was isolated from the squamae of the extensive lesions of achromatic pityriasis versicolor [*R.A.M.*, xix, p. 474] developing in a 23-year-old male Italian as a sequel to prolonged exposure to sunlight.

Dimock (A. W.). **Importance of Verticillium as a pathogen of ornamental plants.**—*Phytopathology*, xxx, 12, pp. 1054–1055, 1940.

Strains of *Verticillium* have been isolated during the past two years at Cornell University (New York) from *Aconitum fischeri* var. *wilsoni*,

Delphinium ajacis, foxglove (*Digitalis purpurea*), mignonette (*Reseda odorata*), *Salpiglossis sinuata*, cineraria (*Senecio cruentus*) (all new host records), *Papaver orientale*, *Phlox drummondii*, *P. paniculata* (all first reports from North America), *Antirrhinum majus*, *Centaurea cyanus*, *Chrysanthemum morifolium*, sweet pea, geranium (*Pelargonium hortorum*), *Physalis alkekengi*, *Rosa* sp., and *Tagetes erecta*. All the cases except those of *Delphinium ajacis* and *T. erecta* were of natural infection.

In inoculation experiments with chrysanthemum strains of the fungus, *C. morifolium*, *A. majus*, cineraria, *Phlox drummondii*, and *Centaurea cyanus* were found to be both highly susceptible to, and intolerant of, infection, *D. ajacis* was moderately susceptible but very intolerant, while *T. erecta* was very susceptible but tolerant. Lupin and stock (*Matthiola incana*), both reported as hosts of the fungus in Europe, failed to contract infection in these tests. *Chrysanthemum morifolium* and *A. majus* were attacked, not only by their own strains of the organism, but also by those from geranium, *S. sinuata*, *R. odorata*, cineraria, *P. drummondii*, and *Physalis alkekengi*. In fact, the experiments yielded no evidence of host specificity among the strains under investigation, all of which, given appropriate environmental conditions, would probably attack most of the other test plants.

Verticillium is present in almost any planting of *C. morifolium* comprising a number of different varieties. The soil in which this crop has been grown, therefore, should be sterilized before replanting with other ornamentals, especially those as susceptible as *A. majus*, *Centaurea cyanus*, *Phlox drummondii*, and cineraria.

Baker (K. F.), Snyder (W. C.), & Hansen (H. N.). **Some hosts of Verticillium in California.**—*Plant Dis. Reptr*, xxiv, 20, pp. 424–425, 1940. [Mimeographed.]

Fuchsia hybrida and geraniums (*Pelargonium domesticum* and *P. hortorum* Bailey), the former represented by the Lady Washington variety, have been found to show typical wilt symptoms in Alameda County, California, and *Verticillium albo-atrum*, not hitherto reported on these hosts [but cf. preceding abstract] has been isolated from them. Other plants already recorded as harbouring *Verticillium* in the State are cowpea, chrysanthemum, and *Antirrhinum majus*, while a new host for *V. albo-atrum* in the United States is China aster (*Callistephus chinensis*), a few plants of which in commercial seed fields in Santa Barbara and Los Angeles Counties yielded the organism. The affected individuals showed symptoms suggestive of *Fusarium* wilt [*F. conglutinans* var. *callistephi*], and it is thought that some cases of reported breakdown of resistance to the latter disease in the eastern and middle-western States may actually be attributed to *V. albo-atrum*. In fact, 20 per cent. of the specimens received from the Middle West as typical of *Fusarium* wilt yielded only *V. albo-atrum*.

McWhorter (F. P.). **Brief notes on plant diseases.** – *Plant Dis. Reptr*, xxiv, 21, pp. 442–443, 1940. [Mimeographed.]

A large planting of dahlias of various horticultural types in a park at Astoria, Oregon, was found in October, 1940, to be heavily infected by

smut (*Entyloma dahliae*) [*R.A.M.*, xviii, pp. 478, 726; xix, p. 365], the round, black spots of which were so abundant as to coalesce over the leaf surfaces. The outbreak is of special interest in view of the previous detection, in 1935, of the possibly related *E. calendulae* on *Calendula* [ibid., xvii, p. 656] in the same park only 250 yards distant from the dahlia beds. *E. calendulae* was again observed just outside the town in 1938. Some 20 other dahlia plantings in and near Astoria are apparently free from smut.

Douglas (M. E.). **The case of rotty Irises. An amateur's observations of Iris susceptibility and resistance to soft-rot; other reflections of the Iris year.**—*Bull. Amer. Iris Soc.* 76, pp. 64–78, 1940. [Abs. in *Biol. Abstr.*, xiv, 10, p. 1624, 1940.]

This is a report of observations made on the varietal reaction of over 500 bearded irises to rhizome rot (*Erwinia carotovora*) [*R.A.M.*, xviii, p. 31]. Among the 266 varieties classed as resistant, 27 per cent. were found on analysis to have a collective susceptible ancestry of 27 per cent., the corresponding figure for 237 susceptible varieties being 41. The susceptible components in the ancestry of modern iris varieties are stated to be *Iris cypriana* and *I. mesopotamica* with its clone Ricardi, while the resistant are *I. pallida*, *I. variegata*, and the variety Dominion (Cordelia × Amas).

Weiss (F.) & Smith (F. F.). **A flower-spot disease of cultivated Azaleas.**—*Circ. U.S. Dep. Agric.* 556, 28 pp., 14 figs., 1940.

Much of the information presented in this comprehensive account of the azalea (*Rhododendron*) flower spot caused by *Ovulinia azaleae* has already been noticed from another source [*R.A.M.*, xix, p. 412], but the following points are of interest. The most susceptible varieties are those of the Indian (*R. mucronatum*, *R. pulchrum*, and *R. simsii*) and Kurume (*R. obtusum*) groups, the former including Formosa, Brilliant, Pride of Mobile, Comte de Nieuport, Prince of Orange, and the forcing hybrids of Dutch and Belgian origin, such as Mme. Petrick, Prof. Wolters, and Vervaeneana, and the latter Pink Pearl, the symptoms in Kurume varieties, however, are generally less conspicuous than those exhibited by the Indian group. Experimental infection has been obtained on *R. arborescens*, *R. austrinum*, *R. calendulaceum*, *R. nudiflorum*, *R. roseum*, *R. vaseyi*, *R. viscosum*, *R. carolinianum*, *R. catawbiense*, *R. indicum*, *R. japonicum*, *R. obtusum* var. *kaempferi*, *R. molle*, *R. yedoense* var. *poukhanense*, *Kalmia latifolia*, *Gaylussacia baccata*, *Vaccinium corymbosum*, *V. fuscatum*, and *V. tenellum*.

Four species of bumblebees (*Bombus americanorum*, *B. bimaculatus*, *B. impatiens*, and *B. separatus*), the solitary bee (*Emphoropsis floridana*), and the carpenter bees (*Xylocopa micans* and *X. virginica*) appeared to be the most important of the insects tested for the transmission of the pathogen from diseased to healthy plants. During the four-week period of most profuse blooming, an average of 20 per cent. of all the insects tested caused infection. Honeybees (*Apis mellifera*) and the two species of thrips frequenting azaleas, *Frankliniella tritici* and *Heterothrips azaleae*, transmitted the disease in a few trials only. The insects were observed to move from one azalea planting to another

several miles away; in one instance, moreover, *R. nudiflorum*, growing in woods half a mile away from cultivated azaleas and showing typical feeding punctures of *X. virginica*, was found to be infected.

In addition to the elimination of the insect vectors of the disease, indirectly by the provision of a succession of alternative flowering plants, and directly by the application of insecticides, important control measures against the flower spot are the destruction of diseased flowers to reduce the survival of sclerotia to a minimum and the removal of surface soil from round the base of infected plants after blossom fall, and its replacement with new earth or a thick leaf mulch. A copper-clay dust (5 to 6 per cent. metallic copper) should be useful in nurseries, but for ornamental plantings, where discoloration of the flowers must be avoided, a dilute acetic acid spray (1 in 750) should be substituted.

Gardenia leaf spot caused by Rhizoctonia.—*Flor. Rev.*, lxxxvi, 2217, p. 22, 1940. [Abs. in *Exp. Sta. Rec.*, lxxxiii, 5, p. 649, 1940.]

Preliminary studies are stated to have shown that the isolation of *Rhizoctonia* associated with an apparently new leaf spot of gardenia [in the United States] represents at least a new strain. A number of varieties proved susceptible to the fungus in inoculation experiments, but under natural conditions infection has largely been restricted to Pride of Daisy Hill. Control measures are indicated.

Yerkes (G. E.), Mulford (F. L.), McCulloch (Lucia), & Smith (F. F.). **Gardenia culture.**—*Leafl. U.S. Dep. Agric.* 199, 8 pp., 1 fig., 1940.

Popular notes on the following gardenia diseases and their control are included in this leaflet: chlorosis due to one of several adverse physiological factors, including iron deficiency (preventable by the admixture with the soil of ½ lb. sulphur per 100 sq. ft. or 1 lb. aluminium sulphate per 20 sq. ft.) and an unduly low soil temperature (below 70° F.); bud drop, also associated with unfavourable environmental conditions, e.g., extremes of soil temperature and moisture and poor illumination; stem canker (*Phomopsis gardeniae*) [*R.A.M.*, xx, p. 66], for the prevention of which the writers suggest spraying with 4-4-50 Bordeaux mixture or scattering 20 per cent. copper-lime dust or red copper oxide (cuprocide), 1 part in 100 of pure sand, round the crowns; foliar tipburn; [unspecified] leaf spots and sooty mould; brown leaf margins caused by lack of potash and amenable to control by the addition to the soil of 3 lb. potassium sulphate or potassium chloride per 100 sq. ft.; small, dark green leaves and short internodes, due to phosphorus shortage, which may be corrected by the incorporation with the soil of 5 to 25 lb. superphosphate per 100 sq. ft.; and sun scald following the action of strong sunlight on wet leaves.

Luttrell (E. S.). **Tar spot of American Holly.**—*Bull. Torrey bot. Cl.*, lxvii, 8, pp. 692–704, 16 figs., 1940.

American holly (*Ilex opaca*) in North Carolina, and probably throughout its range, is subject to infection by a tar spot of the foliage, characterized by the development in the early summer of reddish-

brown, yellow-bordered lesions, turning to a shining black and producing flat, pulvinate, subepidermal stromata in the autumn; during the winter these organs undergo gradual differentiation and in April the rupture of the outer epidermal layers exposes the orange-red apothecial disks 1 to 4 mm. in diameter. After dehiscence the surrounding leaf tissues succumb to desiccation, forming a buff-coloured necrotic area bearing the exhausted stroma and finally dropping out, leaving perforations. The infected leaves usually persist on the tree for the normal two-year period, but in severe cases death may occur by the end of the first year.

The fungus responsible for the disease, first designated *Rhytisma curtisii* B. & Rav. and later *Macroderma curtisii* (B. & Rav.) v. Höhn., is transferred, on the basis of its structural and morphological features, to the genus *Phacidium* as *P. curtisii* (B. & Rav.) Luttrell nov. comb. [with an emended Latin diagnosis]. The mycelium, entirely intracellular at first, subsequently forms a plectenchymatous stroma in the space vacated by the partially dissolved epidermal and adjacent mesophyll tissues. The clavate to cylindrical asci, 110 [given as 100 in the text] to 160 by 9 μ, arise in the spring from a layer of filiform, simple paraphyses, 100 to 160 by 1·3 μ, and contain eight fusoid to obovate, continuous, hyaline ascospores, 19 to 24 by 5 to 6 μ, which germinate readily and produce short germ-tubes, but further growth in culture was not obtained.

Watson (Alice J.). **Celastrus scandens, a new host for Glomerella cingulata.**—*Plant Dis. Reptr*, xxiv, 19, pp. 385-386, 1940. [Mimeographed.]

Stems of *Celastrus scandens* from New Hampshire showed cankered areas almost girdling the circumference, about one inch in length, dull grey to brown on old stems, and reddish-brown with white centres on young, green ones. Typical *Gloeosporium* acervuli were found in the central portion of the lesions, and perithecia with mature ascospores in some of the older cankers. In both stages the fungus was morphologically typical of *Glomerella cingulata*.

When conidia from plate cultures were applied to scalpel wounds in McIntosh and Greening apples, typical bitter rot lesions rapidly developed.

Fischer (G. W.). **Host specialization in the head smut of grasses, Ustilago bullata.**—*Phytopathology*, xxx, 12, pp. 991-1017, 2 figs., 1940.

This is a comprehensive, tabulated account of cross-inoculation experiments carried out from 1936 to 1939 with 44 collections of *Ustilago bullata* [*R.A.M.*, xix, p. 600] (comprising also *U. bromivora* and *U. lorentziana*) from 36 species of *Agropyron*, *Bromus*, *Elymus*, *Festuca*, *Hordeum*, and *Sitanion*. Eight physiologic races of *U. bullata* have been recognized on the basis of the reactions of the following fourteen differential species: *A. pauciflorum*, *B. brizaeformis*, *B. carinatus*, *B. catharticus*, *B. hordeaceus*, *B. japonicus*, *B. marginatus*, *B. mollis*, *B. secalinus*, *B. tectorum*, *E. canadensis*, *E. glaucus*, *E. sibiricus*, and

H. nodosum. It was found impossible to maintain the supposed specialization of the smut from species of *Agropyron* and *Hordeum* to members of the Hordeae, and that of species of *Bromus* to grasses of the same genus, certain collections from *Agropyron* and *Elymus* being pathogenic to *Bromus* spp., while some from the latter attacked *Agropyron*, *Elymus*, and *Hordeum* spp. Five of the eight races, in fact, number highly susceptible hosts both among the brome grasses and the Hordeae. The most common race (2), widespread in the Pacific North-West on *B. tectorum*, was found to be capable of attacking a number of species of *Agropyron*, *Elymus* (including the economic *E. glaucus*), and *Festuca*, besides a few other brome grasses, while another race (4), prevalent on *B. mollis*, is quite virulent on *E. canadensis*, likewise of economic importance.

The writer's previous proposal for the consolidation of *U. bromivora* and *U. lorentziana* with *U. bullata* [ibid., xvii, p. 45] is now fully substantiated by the inseparability of the three species even on a host specialization basis. Liro's proposed classification of each physiologic race as a distinct species [ibid., iii, p. 369] is not approved, and the eight new races of *U. bullata* are accordingly designated by numbers in accordance with current practice.

Wilson (M.), Noble (M[ary]), & Gray (E. G.). **Blind seed disease of Rye-Grass.**—*Nature, Lond.*, cxlvi, 3702, pp. 492–493, 1 fig., 1940.

Referring to Muskett and Calvert's recent communication on blind seed disease of rye grass [*Lolium perenne* and *L. multiflorum*: *R.A.M.*, xix, p. 709], the authors point out that in 1891 Prillieux and Delacroix (*Bull. Soc. mycol. Fr.*, vii, p. 116, 1891; viii, p. 22, 1892) described a parasite, *Endoconidium temulentum*, on rye, which had toxic properties. The genus *Endoconidium*, because of the endogenous formation of the microconidia, was based on this fungus, its perfect stage later being variously ascribed to *Phialea*, *Stromatinia*, and *Sclerotinia*. In the blind seed fungus [*Helotium* sp.] the authors also observed endogenous production of the microconidia; the measurements of the apothecia, ascospores, and microconidia closely agreed in both fungi, and, further, positive results followed inoculations of the flowers of rye with spores of the blind seed fungus. The only difference is that macroconidia have not been described in *Endoconidium*.

As many as three apothecia of the blind seed fungus were found on a [rye grass] caryopsis, which gave a normal seedling. Cultural experiments indicated that the systemic endophytes of *L. perenne* reported by McLennan, Sampson, and Neill [*R.A.M.*, xix, p. 477] may not be completely dissociated from one another or from the blind seed fungus. The results of the authors' investigations of the *Pullularia* sp. associated with the disease agreed with those of Muskett and Calvert [loc. cit.]. Apparently Gemmell described the blind seed fungus under the name *P. pullulans*.

With reference to Glasscock's work [ibid., xx, p. 22], the authors state that, in a recent test, of 19 rye grass seeds bearing conidia of the blind seed fungus 13 gave rise to normal plants. They conclude that neither the cause of the low germination of rye grass nor the identity of the associated fungi has yet been adequately investigated.

Filinger (G. A.). **Combating fruit pests in Kansas.**—*Circ. Kans. agric. Exp. Sta.* 199, 44 pp., 21 figs., 1940.

This circular (a revision of No. 169 of the same Station by W. F. Pickett and G. A. Filinger) presents in a popular form much useful information on the following fruit diseases and their control in Kansas: apple blotch [*Phyllosticta solitaria*], apple scab [*Venturia inaequalis*], apple black rot or frog-eye [*Physalospora obtusa*], leaf curl and bacterial leaf spot of peach [*Taphrina deformans* and *Bacterium pruni*], brown rot of peaches, plums, and cherries [*Sclerotinia fructicola*], black rot of grapes [*Guignardia bidwellii*], cherry leaf spot [*Coccomyces hiemalis*], blister canker [*Nummularia discreta*], very injurious in Ben Davis, Gano, Missouri, and Winesap apple orchards, fireblight of apples and pears [*Erwinia amylovora*], cedar apple rust [*Gymnosporangium juniperi-virginianae*], plum black knot and plum pockets [*Dibotryon morbosum* and *T. pruni*], crown gall and orange rust of blackberries [*Bact. tumefaciens* and *Gymnoconia interstitialis*], and raspberry anthracnose [*Elsinoe veneta*]. Difficulty has been experienced in combating the last-named disease, but unpublished data from the Kansas Agricultural Experiment Station indicate that good results may be obtained by a dormant (early spring) application of 1 in 10 lime-sulphur, followed by another of the same mixture ($1\frac{1}{4}$ in 50) when the new shoots are 6 to 8 in. high. Spray schedules are also given for the other diseases amenable to this form of control, and a table shows the reaction to scab, blotch, frog-eye, cedar rust [*R.A.M.*, xix, p. 711], and fireblight of 17 apple varieties grown in the State.

Backus (E. J.) & Keitt (G. W.). **Some nuclear phenomena in Venturia inaequalis.**—*Bull. Torrey bot. Cl.*, lxvii, 9, pp. 765–770, 2 pl., 1940.

Details are given of a study at Wisconsin University on the development of the ascus and of nuclear phenomena in the vegetative mycelium, conidiophore, and conidium of *Venturia inaequalis*, the agent of apple scab [*R.A.M.*, xix, p. 547].

Staehelin (M.) & Bovey (P). **La lutte contre la carpocapse et la tavelure des Pommiers et Poiriers, en Suisse romande. Observations et essais effectuées de 1933-1938.** [The campaign against the codling moth and scab of Apple and Pear trees in Romansh Switzerland. Observations and experiments carried out from 1933 to 1938.]—*Annu. agric. Suisse*, xli, 6, pp. 635–680, 3 figs., 5 graphs, 1940.

This is a fully detailed, tabulated survey of experiments carried out over a six-year period in different localities of Romansh Switzerland to determine the most effective methods of combating the apple codling moth (*Laspeyresia* [*Cydia*] *pomonella*) and apple and pear scab (*Venturia inaequalis* and *V. pirina*) [*R.A.M.*, xix, p. 263]. In a general way, the results confirmed those of previous years in emphasizing the great importance of the pre- and post-blossom sprays for scab control, as well as of a late treatment for the prevention of infection in storage [ibid., xix, p. 710]. Preparations with a copper base (oxychlorides or carbonates) should be used for the pre-blossom and late applications, while the second and third post-flowering treatments may be made with

lime-sulphur. In the three last years of the trials the 'blue' spray (5 to 6 per cent. Bordeaux mixture, applied in the very early spring, just before the trees come into leaf) was included in the experimental programme. In 1936, a favourable season for scab development, this single treatment gave equal or slightly superior control to the usual schedule of five to six applications, but in 1937 and 1938 the 'blue' spray, either alone or combined with soluble carbolineum, as used during the dormant period, was less effective than the normal programme, even when supplemented by summer treatments.

VALLEAU (W. D.). **Origin of outbreaks of Peach leaf curl.**—*Plant Dis. Reptr*, xxiv, 17, p. 354, 1940. [Mimeographed.]

The author points out that a study of the literature of the subject indicates that the ascospores of *Taphrina deformans* [*R.A.M.*, xix, p. 549] germinate soon after, and frequently before, their release. They then form a yeast-like colony on the bark of the tree, which is the source of infection a year later, and not the ascospores, as is often assumed. If it is recognized that a saprophytic gametophyte stage lives as a yeast-like fungus on the trees at all times, and that after a cool, wet spring the parasitic sporophytic stage develops in the leaves, then sudden outbreaks of infection in damp, cool years in areas where the disease was not known before, easily become explicable, without any need to assume that the ascospores have been carried over from a previous year or blown in from another locality. Further, late infections on growing point leaves on new shoots a foot or more long, occurring during a cool, wet period late in the spring, are explained without the necessity of assuming secondary infection.

Ministry of Agriculture and Fisheries, England and Wales. Register of growers of certified Strawberry plants, 1940.—2 pp., 1940. [Mimeographed.]

Section I of this register contains an alphabetical list of growers, with their addresses and certificate numbers, of strawberry plants certified as true to variety, attaining a standard of purity of not less than 99·5 per cent., and reasonably free from pests and diseases, while II is arranged under varieties (13), the names of growers and the acreages of their certified stocks being given under each.

MÜLLER (A. S.). **Un estudio preliminar sobre el control de la roya de la Higuera.** [A preliminary study on the control of Fig rust.]—*Agricultor venez.*, iv, 49, pp. 35–37, 2 figs., 1940.

Severe attacks of fig rust (*Cerotelium fici*) having been observed to limit the successful large-scale production of the fruit in the Caracas district of Venezuela, the writer carried out a series of experiments in the control of the disease by dusting, a method regarded as preferable to the standard recommendation of 1 per cent. Bordeaux mixture, with which complete coverage of the lower leaf surfaces is stated not to be easily effected. The treatment was carried out on five one-year-old trees each of the Lemon and Brunswick varieties, a total of seven applications being made at 15-day intervals with the Niagara dusting apparatus with a capacity of 5 kg. of dust. The following results were

obtained. The treated Lemon and Brunswick trees (four branches of three of each group) bore 36 healthy leaves each compared with 27 and 28, respectively, in the controls: 204 and 183 leaves with few pustules (19 and 30, respectively); 25 and 1 with dry areas (44 and 50, respectively); and fallen 8 and 2 (217 and 139, respectively).

KÉBREAU (F.). **La maladie de Sigatoka et le mal de Panama.** [Sigatoka and Panama diseases.]—*ex* **Compte rendu du premier Congrès des Agronomes et Spécialistes du Service National de la Production Agricole et de l'Enseignement Rural.** [Proceedings of the first Congress of Agronomists and Specialists of the National Service of Agricultural Production and Rural Instruction.]—*Bull. Serv. nat. Prod. agric. Haiti* 16, pp. 14–31, 1 fig., [? 1940. Received January, 1941].

A full account is given of the available information concerning the Sigatoka and Panama diseases of bananas (*Cercospora musae* and *Fusarium* [*oxysporum*] var. *cubense*), with special reference to their distribution and pathogenicity in Haiti [*R.A.M.*, xviii, p. 327], where the former was first observed by the writer in November, 1937, at the Damien Experiment Farm, and at about the same time by members of the Standard Fruit Company in two localities at opposite points of the Republic, namely, Carrefour-Dufort (Léogane) and Carrefour Jean Bernard (Grand Rivière du Nord). *C. musae* is stated to be advancing rapidly through the banana-growing regions of the country, assuming an epidemic form at Damien in the rainy season from August to October. Attempts at the cultivation of Cavendish and Gros Michel bananas in low-lying sites where mists are prevalent should be definitely abandoned. Panama disease is also most injurious in districts with a high rainfall and in excessively damp, poorly aerated soils.

British Honduras. Report of the Department of Agriculture for the year 1939.—20 pp., 1940.

The following references to banana leaf spot (*Cercospora musae*) [*R.A.M.*, xvi, p. 195] occur on pp. 1 and 4 of this report. The increasing damage caused by the disease has been an important factor in the rejection of a large proportion of the fruit presented for shipment. The response of growers to an experimental scheme for the control of the pathogen by fungicidal treatment was, in general, not enthusiastic, partly on account of the very poor returns at present being obtained for the banana crop, but a few of those owning extensive plantings on superior types of soil have commenced spraying operations, using small mule-drawn power sprayers with a pressure of 250 to 500 lb. per sq. in. In 1939 the reduction in exports from the Toledo district was 24 per cent. of the 1938 output in quantity and 40 per cent. in value, the decline of production in the Stann Creek Valley was even sharper, the yield being only half that secured in 1938.

MAGEE (C. J.). **Banana leaf spot. Spraying and dusting trials, 1939-40.**—*Agric. Gaz. N.S.W.*, li, 10, pp. 555–558, 1 fig., 1940.

In further spraying tests carried out in New South Wales during 1939-40, satisfactory control of banana leaf spot (*Cercospora* [*musae*: *R.A.M.*, xix, p. 106]) was obtained on all sprayed plots

by three to five applications, from 5th December to 3rd April, of a mixture consisting of 1½ lb. copper oxychloride, 1½ lb. colloidal sulphur (against insect infestation), and wetsit dispersing agent 2·4 fl. oz. in 40 gals. of water, or copper oxychloride and wetsit at the same concentrations, with ½ gal. white oil in 40 gals. of water, or with the first formula, but with basic copper sulphate instead of copper oxychloride. The colloidal sulphur and white oil were included with the object of controlling red spider (*Tetranychus telarius*) and mite (*Phyllocoptes* sp.), which can cause much foliage injury in seasons with prolonged dry periods. The rate of application approximated to 80 gals. per acre at full foliage, and the sprays were applied at a pressure of 150 lb. per sq. in. through a fine disk nozzle. The spray was directed to the under side of the two youngest expanded leaves and the heart leaf at the first application and subsequently to all new leaves. Two plots (with four and five applications, respectively) were outstanding in amount of foliage and absence of infection, probably because some of the treatments synchronized with the chief periods of infection, 26th to 28th October, 31st January to 3rd February, and 29th February to 4th March. It appears at least likely that sprays applied shortly after a spell of weather favourable to infection may prevent an outbreak. If rain interrupts spraying it should be resumed directly the weather permits.

Satisfactory control also followed five applications of a dust containing 20 per cent. basic copper sulphate, 40 per cent. sulphur, 30 per cent. hydrated lime, and 10 per cent. kaolin. Dusting, however, is laborious, unpleasant, and is unlikely to become popular, even with the small proprietor, especially as it has been found that the type of knapsack sprayer operated by a pump in the spray rod is less tiring that the old types.

The present tentative recommendation of spraying at monthly intervals from early December to March is adhered to.

The practical difficulties of applying sprays in plantations on boulder-strewn slopes have been overcome by the collection of water in iron drums conveniently placed throughout the plantation, using a sheet of iron as a catchment, or by the construction of small dams in plantations where springs occur. The sprays may be applied by means of a bucket pump but some growers have installed stationary spray plants and others use portable power sprayers.

During 1939–40 the first period of leaf spot weather occurred from 26th to 28th October and it was observed that a far greater amount of infection occurred in stools where a bunch subtended by infected foliage from the previous season was present. Sometimes the influence extended to two or three stools and it is probable that the beneficial effect of spraying will be cumulative. The observation also explains why the disease is rarely important in young plantations. It is proposed in the 1940–41 trials to apply the first spray early in October after the plants have been stripped of all spotted foliage that can be spared.

Enfermedades de las Aguacates. [Avocado diseases.]—*Agricultor venez.*, iv, 49, p. 47, 1940.

Diplodia cacaoicola [usually regarded as identical with *Botryodiplodia theobromae* and various other species: *R.A.M.*, xviii, p. 788] was isolated

in pure culture from the cortical tissues of dying avocado trees situated in hard, compact, dry soil in the Guarenas (Miranda) district of Venezuela, and is believed to have been a contributory factor in the trouble. Cacao trees in the vicinity doubtless constituted a focus of infection. Since the fungus enters its hosts through wounds, the practice of cutting the bark with a knife should be discontinued. All infected material should be removed and the trees liberally supplied with water, drainage being provided where necessary.

HENRY (B. W.) & WAGNER (ELIZABETH C.). **A rapid method of testing the effects of fungicides on fungi in culture.**—*Phytopathology*, XXX, 12, pp. 1047–1049, 1 fig., 1940.

The writers' method of testing the efficacy of fungicidal dusts consists essentially in the application of the test material either as a dust or a spray, by methods which are described in detail, to half of a Petri dish culture containing a central colony 2·5 to 3 cm. in diameter. The plates are then incubated at the optimum temperature for the fungus under investigation (*Diplodia zeae* in the authors' experiments) for the period normally required to attain a diameter of 8·5 to 9 cm. If the fungicide is effective, the growth of the mycelium proceeds in the ordinary way on the untreated section of the plate, but is inhibited on the dusted or sprayed half.

FERNANDO (M.). **The incidence of plant disease in Ceylon in relation to environmental factors.**—*Trop. Agriculturist*, XCV, 2, pp. 72–78, 1940.

The author points out that resistance to fungal and bacterial disease in plants is by no means uniformly correlated with plant vigour, though instances of parallelism do exist. In Ceylon humidity is the chief environmental factor conditioning plant disease. Citrus canker (*Pseudomonas citri*) and bacterial wilt (*Bacillus* [*Bacterium*] *solanacearum*) of Solanaceous plants are major problems only in the wet part. Panama disease of plantains (*Fusarium oxysporum* [var. *cubense*]) is severest in damp, low-lying areas subject to frequent flooding. Sclerotial diseases of rice (*Sclerotium oryzae* [? *Leptosphaeria salvinii*] and *Rhizoctonia* [*Corticium*] *solani*) are particularly virulent in swampy land. *Thielaviopsis* [*Ceratostomella*] *paradoxa* becomes epiphytotic on pine-apples planted in badly drained soil. The effects of light are closely associated with those of humidity, humid conditions under shade favouring spore germination and growth; temperature conditions, however, are almost everywhere and in all seasons favourable to infection. Both soil texture and soil reaction may be important factors, for example, root rot (*Fomes lucidus*) [*Ganoderma lucidum*] of coco-nuts and brown root (*F. noxius*) of tea and rubber being particularly damaging on light soils, whereas *Sphaerostilbe repens* is most virulent to papaw and other plants on heavy, poorly aerated soils. Fertilizers also affect disease incidence: data are given showing that a single application of nitrogenous fertilizer with potash and superphosphate to cotton at Maho produced significant increases in the incidence of sore shin (*R.* [*C.*] *solani*). The severity of this disease appeared to increase *pari passu* with the amounts of artificials used.

Botryodiplodia theobromae is usually regarded as a saprophyte, but the fungus can attack tea depleted of the starch reserves in the roots by too frequent picking or too brief a pruning cycle. Generally speaking, influences reducing host vigour stimulate the development of facultative parasites, including wound parasites, whereas in the case of obligate parasites resistance frequently falls as host vigour increases and vice versa.

Perotti (R.). **Biologia vegetale applicata all' agricoltura. III, Micologia —malattie parassitarie.** [Plant biology applied to agriculture. III, Mycology—parasitic diseases.]—x+[2]+1191 pp., 401 figs., Turin, Rosenberg & Sellier, 1940. [Abs. in *Exp. Sta. Rec.*, lxxxiii, 5, p. 636, 1940.]

This instalment of a five-volume work on the biology of crop plants treats in the first place of general questions relating to parasitic diseases, including morbid anatomy, and then discusses specific diseases, arranged according to their etiological agents under the headings of bacteria, viruses, Myxomycetes, and the various groups of true fungi. The volume terminates with a section on immunity in plants and general control measures, author and subject indexes being appended.

Setterstrom (C.). **Effects of sulphur dioxide on plants and animals.**—*Industr. Engng Chem.*, xxxii, pp. 473–479, 3 figs., 2 graphs, 1940.

In this paper the author briefly reviews the results obtained in three years' investigations carried out at the Boyce Thompson Institute, New York, in collaboration with P. W. Zimmerman, W. J. Youden, A. Hartzell, W. Crocker, and F. R. Weedon, into the effects on plants and animals of exposure to low concentrations of sulphur dioxide [*R.A.M.*, xviii, p. 467; xix, p. 34]. The apparatus used in the study is described in detail and a bibliography of 43 titles is appended.

Rigler (N. E.) & Greathouse (G. A.). **An automatic zero pipette for dispensing sterile culture media.**—*Science*, N.S., xcii, 2390, pp. 363–364, 1 fig., 1940.

A description is given of an automatic zero pipette, similar to those commercially available but made in Pyrex glass and specially adapted for sterilizing and aseptically dispensing measured quantities of liquid culture media into sterile flasks.

Grainger (J.). **Virus and vital organization.**—*Nature, Lond.*, cxlvi, 3704, pp. 539–541, 3 graphs, 1 diag., 1940.

In this paper the author adduces evidence in support of the view that a virus is a living entity, since it exhibits a type of independent movement through the host that can only be interpreted as autonomous, and is also independent of the host in its temperature relations.

Schopfer (W. H.) & Blumer (S.). **Recherches sur la répartition de l'hétérotrophie par rapport à l'aneurine chez les champignons.** [Studies on the distribution of heterotrophy in relation to aneurin among the fungi.]—*Arch. Mikrobiol.*, xi, 2, pp. 205–214, 2 figs., 1940.

Further particulars are given of the authors' studies at the Berne

Botanical Institute on the aneurin requirements of representatives of various groups of fungi [*R.A.M.*, xix, p. 562]. Of the Polyporaceae included in the investigations none was absolutely dependent on aneurin (the complete molecule of vitamin B^1), *Polyporus adustus* thriving in the presence of pyrimidin alone, *P. squamosus*, *P.* [*Polystictus*] *zonatus 2 ab*, and *Hypholoma fasciculare* developing about equally well with pyrimidin plus thiazol and aneurin, *Polyporus* [*Polystictus*] *abietinus*, *P. zonatus 7* a^1b^1, and *Polyporus benzoinus* better with the two aneurin constituents than with B^1 itself, while *Polystictus versicolor* responded more favourably to aneurin.

Among the Ustilagineae *Tilletia levis* [*T. foetens*] was found to be auxo-autotrophic, *T. tritici* [*T. caries*] did not appear to require aneurin to the extent indicated by Défago [ibid., xix, p. 644], growing only slightly better with than without growth factors, while *T. horrida* [ibid., xviii, p. 711] developed most profusely in the presence of pyrimidin plus thiazole (57·6 mg.), followed by aneurin (50·2), compared with 1·4 mg. for the control.

Septoria apii also grew best in the presence of pyrimidin plus thiazole, followed by aneurin (135·5 and 134·9 mg., respectively), the corresponding figures for pyrimidin alone and the control being 58·8 and 8·1 mg., respectively. *Mycosphaerella grossulariae* proved to be auxo-heterotrophic in respect of aneurin or a combination of its two components.

Torulopsis candida (Fungi imperfecti), as already shown by Rennerfelt [ibid., xviii, p. 198], is favoured by the presence of *Penicillium rugulosum* in mixed cultures and fails to react to aneurin. *Pericystis apis* (Endomycetales) [ibid., xvi, p. 673] also gave evidence of marked auxo-heterotrophy and indifference to aneurin. The indispensable growth factors for *T. candida* and *P. apis* are contained in completely hydrosoluble, concentrated yeast extracts, of which Hoffmann-La Roche's was the most effective of the three tested.

Tamargo (M. A.). **A study of seedlings and varieties of the Irish Potato in Cuba.**—*Amer. Potato J.*, xvii, 12, pp. 323–327, 1940.

Three years' observations at the Agricultural Experiment Station, Santiago de las Vegas, Cuba, showed that most of the potato seedlings and varieties introduced for trial purposes tended to lose their native vigour in their new environment on account of climatic influences (short days) and virus diseases (notwithstanding drastic roguing). Some resistance to mosaic was shown by Alma, Hindenburg, Odenwälder Blaue, and Weltwunder, while Duke of York, Gloria, Hetman, and Jubel were highly susceptible. Carnea and Ackersegen showed a certain amount of silver scurf [*Spondylocladium atrovirens*], but these two varieties were the most resistant to blight (*Phytophthora*) [*infestans*], followed by Ovalgelbe, Henderson, and Gloria; Centifolia, Bintje, Rosafolia, Allerfrüheste Gelbe, Jubel, Odenwälder Blaue, Royal Kidney, Hetman, Weltwunder, and Duke of York were very susceptible.

Reddick (D.). **Problems in breeding for disease resistance.**—*Chron. bot.*, vi, 4, pp. 74–77, 1940.

Twenty years ago the author formed the opinion that potato blight

(*Phytophthora infestans*) was the type of disease requiring a permanent scheme of control, justifying a substantial expenditure of time and money, and the development of the situation during the interim has in no way modified his views. An interesting survey is given of the history of the fungus [*R.A.M.*, xix, p. 300], and of the attempts to date to breed resistant potatoes by crossing certain wild Mexican species of *Solanum*, notably *S. demissum*, a collective species comprising mostly immune forms, with commercial varieties [ibid., xix, pp. 40, 490]. The first record of the fungus in South America is that of Lagerheim in 1891 and the author considers it was introduced into this region on the European potato. There are now extant four physiologic races of *P. infestans* in North America, ranging in virulence from the level attained on Green Mountain through President through KB/5 to AAB/2, the two last-named representing groups of hybrids. The virulence of *P. infestans* is enhanced by passage through a resistant host such as President, and it is possible that an almost infinite range of races would develop if suitable intermediates were produced, and that by such a process the immunity of the original wild parent might ultimately be broken down. Bearing in mind the fact that the pathogen, once raised to a given level of virulence, remains at that degree of intensity for at least 20 passages on any variety, the wisdom will be apparent of the present practices of inoculating all new seedlings with the most virulent culture obtainable, destroying all reactors, and endeavouring to eliminate the President variety as inimical to potato cultivation in North America.

Coates (W. H.). **The influence of a three-year rotation and fertilizer treatments on the organic carbon of soils.** *ex* **Experiment with Potatoes.**—*Bull. N.H. agric. Exp. Sta.* 324, pp. 19–25, 1 graph, 1940.

In connexion with a study on the effects of various fertilizer treatments and a triennial rotation on the organic carbon level of New Hampshire soils, experiments were carried out in the control of potato scab [*Actinomyces scabies*] on limed plots by the admixture with the soil of aluminium sulphate (200 to 900 lb. per acre) or sulphur (200 to 600 lb.). Although both substances reduced the incidence of infection, in no case was perfect control obtained, and in view of their high cost, growers would probably be better advised to plough under green manure crops or apply sulphate of ammonia broadcast to achieve comparable results.

Severin (H. H. P.). **Potato naturally infected with California Aster yellows.**—*Phytopathology*, xxx, 12, pp. 1049–1051, 1 fig., 1940.

A volunteer potato plant was collected in the Montana Mountains in 1936 with purple, sessile aerial tubers growing from the leaf axils, and in turn giving rise to purple, dwarfed foliage. Two lots of 20 previously non-infective long-winged aster leafhoppers (*Macrosteles divisus* = *Cicadula divisa*), a newly discovered vector of the aster yellows virus present in the locality in question, conveyed the typical symptoms of aster [*Callistephus chinensis*] yellows from the diseased potato to two healthy aster plants after an average feeding period of four days,

showing that the potato was naturally infected by the California aster yellows virus [*R.A.M.*, xiv, p. 312].

Eight potato plants with aerial tubers suffering from psyllid yellows and bearing the insect causing this disease, *Paratrioza cockerelli* [ibid., xiv, p. 117] neither acted as reservoirs of the aster yellows virus, judging by the negative outcome of transmission experiments with the long-winged leafhopper, nor did psyllid yellows develop in their progeny by way of the tubers.

SAMUEL (G.). **Potato planting in relation to health certification.**—*J. Minist. Agric.*, xlvii, 3, pp. 166–172, 9 figs., 1940.

Certificates issued by the Ministry of Agriculture and Fisheries after inspection of growing crops of potatoes in England and Wales now take into consideration the health as well as the purity of the crops, which have to comply with two conditions, viz. (1) the seed planted must be Class I (Scotch) with S.S., T.S.(A), T.S.(H), N.I.(A), or N.I.(H) certificate, Class I (Irish), Class I (English Special Stock), or Class I (Welsh Special Stock), and (2) the crop must be grown at least 50 yards away from any other potatoes not eligible for entry under (1). These conditions are intended to ensure that the stock is of a good standard of health, and is grown in some degree of isolation from outside sources of infection. It is emphasized that the aim of the English scheme is to indicate those stocks that are likely to have maintained their health to a satisfactory extent during their first year of growth for ware production. It is essentially different from the Scotch, Irish, Welsh, or English special stock schemes which are concerned only with producing healthy seed.

The author briefly summarizes the chief factors affecting the health of seed potatoes in England and discusses the spread of virus diseases within the crop and spread into a crop from outside sources. A good instance of the latter was observed in Kent in 1938 when leaf roll spread from one corner of a field, the source of infection possibly being an adjacent *Brassica* crop that had been cleaned up soon after the potatoes had been planted. Similar spread of leaf drop streak [potato virus Y] has also been observed. He considers that it is preferable not to plant potatoes adjacent to an overwintered *Brassica* crop. The destruction of the haulm before the time of natural dying down makes for more healthy seed but, except in blight [*Phytophthora infestans*] years it probably reduces ware production too much to be considered. The paper concludes with notes on examples of good and poor planting arrangements met with during the year.

Ministry of Agriculture and Fisheries, England and Wales. Register of certified stocks of Potatoes 1940.—55 pp., 1940. [Mimeographed.]

This register is divided into two parts, I (immune varieties) and II (non-immune), showing in alphabetical order the varieties, names and addresses of the growers or other certificate holders and the acreage certified in respect of purity of stock and freedom from severe virus diseases and wildings [see preceding abstract].

RYKER (T. C.) & JODON (N. E.). **Inheritance of resistance to Cercospora oryzae in Rice.** —*Phytopathology*, xxx, 12, pp. 1041–1047, 2 figs., 1940.

During the growing seasons of 1936 and 1937, the following crosses were made at the Louisiana Agricultural Experiment Station between rice varieties resistant or susceptible to *Cercospora oryzae* [*R.A.M.*, xix, p. 301] and their progenies subsequently tested for reaction to the pathogen in the field and greenhouse: Fortuna (highly resistant) × Blue Rose (susceptible), C.I.461 × Early Prolific (same combination), C.I.461 × Blue Rose, Blue Rose × C.I.4440 (highly resistant) and reciprocally, and C.I.4440 × selection 283 A-10-1-1-3 (from the susceptible Edith × Fortuna). The F_1 offspring of all these crosses showed resistance to the leaf spot, while the F_2 (with the exception of C.I.4440 × selection 283 A-10-1-1-3, which largely escaped natural infection and was not artificially inoculated) segregated into resistant and susceptible populations on the 3:1 ratio anticipated on the basis of single pair of genes controlling resistance. The F_3 progenies of four of the crosses (omitting the anomalous C.I.4440 × selection) behaved according to expectation on the assumption that resistance is due to a single dominant factor.

SOESMAN (J. G.). **Tapvlakziekten en tapvlakbehandeling van Hevea brasiliensis.** [Tapping surface diseases of *Hevea brasiliensis* and the treatment of the tapping surface.] —*Bergcultures*, xiv, 41, pp. 1305–1311, 2 graphs, 1940.

Referring to Heubel's recent survey of the various methods practised in the Dutch East Indies for the control of diseases of the tapping surface of *Hevea* rubber [*R.A.M.*, xix, p. 726 and next abstract], the writer describes the results obtained by the application, under the direction of the Besoeki (Java) Experimental Station, of different modifications of the tapping system and treatment of the tapping surface in relation to production in a plantation situated 500 to 800 m. above sea-level, with an annual rainfall of 4,400 mm. The success achieved in the eradication of stripe canker (*Phytophthora faberi*) [*P. palmivora*] from 1933 to 1937 by a conservative system of tapping, antiseptic treatment of the tapping surface, and plantation hygiene was fully maintained in subsequent seasons [ibid., xvi, p. 772], cost of control being reduced in 1937 and 1939 to 14 and 7 per cent., respectively, of that obtaining in 1934. Similar measures are applicable to the control of mouldy rot [*Ceratostomella fimbriata*].

MULDER. **Tapvlakziekten en tapvlakziektenbehandeling van Hevea brasiliensis.** [Tapping surface diseases of *Hevea brasiliensis* and their treatment.] —*Bergcultures*, xiv, 43, pp. 1368–1372, 1940.

Heubel's recommendations for the control of stripe canker [*Phytophthora palmivora*] and other diseases of the tapping surface of *Hevea* rubber [see preceding abstract] are discussed in the light of the writer's personal experience in Java, and considered to be open to criticism on certain points, notably in the failure to lay sufficient stress on the need for the preventive, as opposed to curative, treatment of infection in humid localities.

MEREDITH (C. H.). **A quick method of isolating certain Phycomycetous fungi from the soil.** *Phytopathology*, xxx, 12, pp. 1055–1056, 1940.

The following technique has proved convenient and effective in the isolation of seedling- and root-rotting Phycomycetes from Iowa soils. The mouth of a sterile test-tube is thrust vertically to a depth of about 1 in. into the soil, withdrawn, and the plug reinserted. In the laboratory a small quantity of the soil is spread over the surface of a flamed cover glass, over which a Petri dish containing 2 per cent. nutrient-free agar is inverted and lowered until the uppermost soil touches and adheres to the agar surface. The dish is covered while inverted and incubated at 20° to 25° C. Single hyphal tips usually appear at the edge of the soil in 24 to 48 hours, and are transferred to plain agar in another dish. Pure cultures are frequently obtained immediately by this method, but when bacterial contamination occurs a small portion of the culture is transferred to the under side of maize meal, oatmeal or plain agar in another dish, a V shaped slit being cut in the agar for this purpose. The fungus usually grows up through the agar in 24 to 48 hours and can then be transferred in a pure state to a suitable medium.

Pythium de Baryanum having been observed to be less prevalent in the surface soil of lucerne plantings during mid- or late summer after a protracted dry, hot spell than during a period of moderate temperature and plentiful moisture, isolations were made by the foregoing method in 1936 and 1937 to determine the extent of the Phycomycetous soil population at different dates. In April and May, 1936, loam soils yielded cultures of *P. de Baryanum*, *P. ultimum*, *P. rostratum*, *P. echinulatum*, *P. pulchrum*, and *P. vexans*, while among the 50 isolates from silt loams in March, 1937, were 21 of *P. de Baryanum*, 9 of *P. pulchrum*, and 7 of *P. rostratum*, the remainder being unidentified Phycomycetes. Of 10 strains obtained from a silty clay loam maize field in July, 1937, six were *P. rostratum*, three unidentified Phycomycetes, and one a species of *Fusarium*. *P. ultimum* was the only Phycomycete among 50 organisms isolated from loam, silt loam, and silty clay loam maize field soils from 23rd to 27th July, 1937.

It is apparent from these data that *P.* spp. are predominant in Iowa soils in the spring and rare in late July.

RANGASWAMI IYENGAR (R. S. S.) & GRIFFITH (A. L.). **Entomological investigations on the spike disease of Sandal (35). Further studies on the spike disease of Sandal.** *Indian For. Rec.*, N.S., Entom., vi, 4, pp. 86–196, 12 pl., 1940.

Further extensive experiments in Madras on the insect transmission of sandal spike [*R.A.M.*, xviii, p. 818] indicated that the vector is active in this direction during the night at two seasons of the year, namely, March to April and August to November. The difficulty of obtaining positive results in cages suggests the intervention of an uncommon species: suspicious symptoms have been induced by *Moonia albimaculata*, *Nezara viridula*, *Dassus indicus*, and *Coccosterphus tuberculatus*, and one of these may very likely be concerned in the conveyance of infection from diseased to healthy trees. No analogous symptoms have so far been transmitted by leaf-grafting (the most

effective of the various methods tested). One month's exposure was found to suffice for the development of infection.

The criteria for the presence of the disease should be (*a*) the typical symptoms of stiff, straight, bristly leaves, becoming progressively smaller, narrower, more pointed, and fewer, and failure to produce flowers or fruit; (*b*) the transmission of infection to healthy plants by leaf-grafting; and (*c*) the death of the tree within a period of two to three years. Lack of attention to these three essential points has been responsible for unreliable claims to the discovery of the insect vector, especially as morphological symptoms of the disease have been induced by factors other than the virus itself, namely, mass-feeding of insects, sickliness of the host plant, and associating the sandal with certain species of host plant (e.g., *Pithecolobium* [*Samanea*] *saman*).

Artificial defoliation was found to force out the expression of spike symptoms in 'masked' trees, which have been shown to constitute sources of infection, and has proved very useful in control operations in the forest, as well as in saving time in experimental work.

The average time elapsing between the inception of spike infection and its external manifestation is roughly 7 and 4½ months under natural and artificial conditions, respectively, and the average period from the appearance of symptoms to the death of the tree about 15 months, varying with girth.

The copious experimental data secured by the authors are presented in tabular form in appendixes A, B, C, D, and F. Appendix E is a summary by N. C. Chatterjee of the fauna caught on sticky papers.

Wiehe (P. O.). **L'influence de la saison et des engrais potassiques sur le développement du 'eye spot' de la Canne à Sucre.** [The influence of the season and of potassium fertilizers on the development of 'eye spot' of Sugar-Cane.]—*Rev. agric. Maurice*, xix, 2, pp. 57–61, 3 graphs, 1940.

On the high plateaux of Mauritius the lesions produced on sugar-cane leaves by *Helminthosporium ocellum* [*H. sacchari*: *R.A.M.*, xvii, p. 487] increase progressively in number and size from April onwards until they reach a maximum in September or October, after which they cease to appear in the hot season. Records made in a field of BH 10/12 sugar-cane at Cascade (altitude 1,100 ft., annual rainfall 125 in.) showed that on 8th December, 6th February, 20th April, 7th August, and 12th October (1938–9) the average infection of the leaf area, as determined by an arbitrary scale, was, respectively, 7·5, 3·2, 9·8, 18·5, and 20·9 per cent. The apical part of the leaf was that most seriously affected and the lesions spread most quickly in the cold months. The average monthly temperatures in the locality concerned in 1938–9 were, December 22·2° C., February 24·1°, April 22·7°, August 16·9°, and October 19·4° and the effect of temperature on the progress of infection was clearly demonstrated. Some varieties, including resistant ones, became attacked in winter [ibid., vii, p. 200].

Other observations (from December to October) on leaves of the same variety growing in plots receiving complete fertilizer and plots given equivalent amounts of nitrogen and phosphoric acid, but no potassium, showed that average infection was 12 and 9·6 per cent., respectively.

Luthra (J. C.), Sattar (A.), & Sandhu (S. S.). **Experiments on the control of smut of Sugarcane (Ustilago scitaminea Syd.).**—*Proc. Indian Acad. Sci.*, Sect. B, xii, 4, pp. 118–128, 1940.

The following measures were found to be effective in the control of sugar-cane smut (*Ustilago scitaminea*) in recent experiments at Lyallpur and Risalewala, Punjab [*R.A.M.*, xvii, p. 501]: the use of clean setts for planting; disinfection of setts by five minutes' immersion either in 0·1 per cent. mercuric chloride or 1 per cent. formalin (followed in the latter case by two hours' covering with a damp cloth); the immediate roguing of smutted plants; and discouraging growers from ratooning diseased crops. Both the chemical treatments completely eliminated infection without adverse effects on germination or yield, whereas the percentage smut infection in the controls inoculated by smearing the buds of the setts with spores at planting was 13·8 in the 1936 experiment and 19·7 in that of 1937, other controls similarly inoculated but dipped in water for 5 minutes before planting showing 24·4 and 36·1 per cent., respectively.

Luthra (J. C.), Sattar (A.), & Sandhu (S. S.). **Some studies on the physiology of Cytospora sacchari Butl., the causal fungus of stem canker disease of Sugarcane.**—*Proc. Indian Acad. Sci.*, Sect. B, xii, 4, pp. 172–188, 9 graphs, 1940.

Continuing their studies at the Punjab Agricultural College on *Cytospora sacchari* [*R.A.M.*, xviii, p. 139], the writers found raw sugar, oatmeal, and Richards's agar more conducive to the linear growth of the fungus than Brown's agar, with or without starch, normal and double-strength Richards's promoting the maximum development. Growth declined as a result of the omission of sucrose from Richards's agar, or its replacement by glucose or lactose; maltose, on the other hand, served equally well as sucrose as a nutrient. Maximum growth was attained in media containing sucrose at the rate of 200 gm. per l. The development of *C. sacchari* was not materially affected by the exclusion from the substratum of potassium nitrate, potassium dihydrogen phosphate, or magnesium sulphate, provided the hydrogen-ion concentration was adjusted to P_H 5. The minimum, optimum, and maximum temperatures for the growth of the pathogen were found to be below 15°, 30°, and 35° to 40° C., respectively. The fungus developed most profusely at P_H 3·8, growth ceasing at 1·8 and 7·8 on the acid and alkaline sides, respectively. These observations have an important practical bearing on sugar-cane cultivation in the Punjab, where most of the soils are too alkaline (P_H 7 to 8·5) to support the parasite, thereby eliminating the possibility of infection from this source. During a 35-day period pycnidia were formed on the raw sugar media and oatmeal only, their numbers being directly proportional to the concentration of the oatmeal medium ($\frac{1}{8}$ to 4 times normal in the experiments described) and to the amount of sucrose added. The addition of maltose to Richards's agar induced pycnidial formation, and light was another favouring factor in the development of these organs.

Wehmeyer (L. E.). **Contributions to a study of the fungus flora of Nova Scotia. V. Discomycetes.**—*Canad. J. Res.*, Sect. C, xviii, 11, pp. 535–549, 1 pl., 6 figs., 1940.

Continuing his studies on the fungus flora of Nova Scotia [*R.A.M.*,

xix, p. 433], the author gives an annotated list of 138 Discomycetes found in that region.

Cooke (W. B.). **Preliminary host index to fungi of Mount Shasta, California.** *Plant Dis. Reptr, Suppl.* 123, pp. 125–133, 1940. [Mimeographed.]

A list is given of the fungi observed by the writer during the summers of 1937, 1938, and 1939 on trees and other plants on the south-west slopes of the volcanic Mount Shasta, California. Several of the rusts and smuts are claimed to be new records for the State.

Imazeki (R.). **Observations on Japanese fungi (V.).**—*J. Jap. Bot.*, xvi, 10, pp. 583–591, 9 figs., 1940.

This is a critically annotated list [cf. *R.A.M.*, xix, pp. 119, 238] of six species of wood-decaying *Fomes* collected in Japan, including *F. fastuosus*, causing pocket rot of *Melia azedarach* var. *japonica*, and *F. hamatus* (Corner) Imazeki n. comb. (syn. *F. senex* var. *hamatus*) causing a white rot of *Castanea crenata* and *Castanopsis cuspidata*.

Hiratsuka (N.). **Miscellaneous notes on the East Asiatic Uredinales with special reference to the Japanese species.**—*J. Jap. Bot.*, xvi, 10, pp. 613–617, 1940.

This critically annotated list of 14 Japanese rusts [*R.A.M.*, xix, pp. 240, 729] includes, besides three new species, a new host, *Rhododendron parvifolium*, for *Chrysomyxa rhododendri* [ibid., xiv, p. 174].

De Sousa Da Camara (E.), De Oliveira (A. L. B.), & Da Luz (C. G.). **Uredales aliquot Lusitaniae I.** [Some rusts of Portugal I.]—*Agron. lusit.*, i, 4, pp. 410–434, 1939. [Received January, 1941.]

A critically annotated list is given of 40 rusts collected in Portugal from 1937 to 1939, 11 of which are enumerated in the present instalment as new records for the country. Mention may be made of the following: *Uromyces betae* on beet, *U. ciceris-arietini* on *Cicer arietinum* [*R.A.M.*, xviii, p. 549], *U. renovatus* on lupins (*Lupinus albus. L. angustifolius*, *L. cosentini*, and *L. digitatus*), *U. graminis* on the petioles and inflorescences of *Foeniculum vulgare* [ibid., xix, p. 566] (the aecidial stage obtained by inoculation), *U. fabae* on lentils [ibid., xviii, p. 204], *U. phaseoli vignae* [*U. vignae*] on cowpea [ibid., xviii, p. 91], *U. striatus* [ibid., xviii, pp. 141, 397] on *Medicago hispida*, *U. terebinthi* on pistachio nut [ibid., xiv, p. 742], *Kuehneola* [*Cerotelium*] *fici* on figs [see above, p. 124], *Gymnosporangium amelanchieris* on *Amelanchier vulgaris* [ibid., xv, p. 609], *G. juniperi* on *Pyrus aucuparia* [ibid., xvii, p. 535], *G. sabinae* on pear and *Juniperus phoenicea*, and *Puccinia antirrhini* (first record for Portugal) on *Antirrhinum majus*, *A. graniticum*, *A. linkianum*, and *A. meonanthum*.

De Haan (I.). **Kaligebrek in de Theecultur.** [Potash deficiency in Tea cultivation.] *Bergcultures*, xiv, 41, pp. 1292–1295, 3 figs., 1 graph, 1940.

The writer's observations in West Java (in collaboration with Schoorel) on the physiological importance of potash in the metabolism of the tea

plant, as determined by the pathological symptoms developing in the presence of insufficient quantities of the element in the soil, as well as by ash analyses, have already been summarized from another source [*R.A.M.*, xx, p. 83].

GADD (C. H.). **Ring-barking of trees, and root diseases.**—*Tea Quart.*, xiii, 3, pp. 117–123, 1940.

Discussing the ring-barking of trees in relation to root diseases of tea in Ceylon [cf. *R.A.M.*, xix, pp. 369, 678], the author states that locally the disease common in jungle clearings is *Poria hypolateritia*, but as in the case of *Armillaria mellea* in Nyasaland [ibid., xix, p. 311], preliminary examination of the standing jungle gives little indication of where the disease may occur when tea is planted. There is virtually no evidence in Ceylon that new centres of infection by *P. hypolateritia* are started by spores. The indications are that diseased areas of tea planted in jungle clearings originate from the jungle roots. In areas planted on grass land the problem of jungle roots never arises, but when shade trees are felled root disease may originate at the stump and pass to the tea, the roots of which are in contact with the stump roots.

In a case reported by the author [ibid., xvi, p. 635], some 6,000 *Grevillea* trees grown as shade for tea were felled, and about two years later 30 per cent. of the stumps gave rise to brown root disease (*Fomes noxius*), over 3,000 tea bushes requiring to be eradicated; it is possible that this outbreak was due to underground infection of the stump roots, and not to spore infection, though in this case *F. noxius* must have been living freely in the soil, or it was already established on the roots of *Grevillea* or tea. Records from an up-country estate show that 1,752 *Grevillea* trees were ring-barked in 1930, and cut down at a height of 3 to 4 feet in 1939, but that no case of root disease has so far occurred in the tea associated with these roots. It is therefore apparent that killing trees by ring-barking before felling does not materially increase the danger of subsequent root diseases, but more probably reduces it. The method is worth testing whenever shade trees have to be removed, though it is recommended that the practice of eliminating exposed wood surfaces be maintained also.

BEST (R. J.). **The action of electrolytes on solutions of Tobacco mosaic virus nucleoprotein (Marmor tabaci var. vulgare Holmes).**—*Aust. J. exp. Biol. med. Sci.*, xviii, 3, pp. 307–312, 1 fig., 1940.

Full details are given of chemical studies on the effect of electrolytes on the precipitation of the tobacco mosaic virus protein. With the majority of salts the virus precipitated at and near the critical concentration was in the form of fibres or acicular paracrystals, the length and thickness of which varied with the different salts. A marked influence on precipitating power was found to be exerted by the anion, a lyotropic or Hofmeister series being evident with the following order of efficiency (on a molar basis): nitrate < thiocyanate < iodide < bromide < chloride, succinate, acetate < phthalate < phosphate < oxalate < tartrate < malate < sulphate < citrate. Salicylates act anomalously and denature the protein [*R.A.M.*, xix, p. 496].

Lea (D. E.) & Smith (K. M.). **The inactivation of plant viruses by radiation.** *Parasitology*, xxxii, 4, pp. 405–416, 6 graphs, 1940.

A full description is given of experiments at the Plant Virus Research Station and the Strangeways Research Laboratory, Cambridge, on the inactivation by X-rays (nearly monochromatic, wave-length 1·5 Å.) [*R.A.M.*, xix, p. 437] and ultra-violet light (Vitreosil 'Home-Sun' lamp, operating at 50° C. and containing neon, and mercury vapour at low pressure, 2537 Å.) of crude clarified sap, collodion filtrates, precipitates, and purified preparations of the tobacco mosaic (*Nicotiana* virus 1), tobacco necrosis (*N.* virus 11), and tomato bushy stunt (*Lycopersicum* virus 4) viruses, the effects of the treatment being determined by the half leaf inoculation method, using French bean (*Phaseolus vulgaris*) as a test plant for tobacco necrosis and *Nicotiana glutinosa* for tobacco mosaic and tomato bushy stunt. The curves obtained by plotting against the dose of radiation the number of lesions resulting from inoculation of a test plant were found to be exponential, the degree of inactivation being proportional to the intensity of irradiation. The inactivation curves obtained with preparations of a given virus in different states of aggregation do not appear to differ systematically. The mechanism of aggregation in virus suspensions is discussed in the light of these results.

Thornberry (H. H.) & Anderson (H. W.). **Pink-root disease of Onions on Tomatoes.**—*Plant Dis. Reptr*, xxiv, 19, pp. 383–384, 1940. [Mimeographed.]

During 1940 tomatoes near Chicago developed a pink-root disease apparently due to *Phoma terrestris* [*R.A.M.*, xix, pp. 4, 328]. The small roots showed the discoloration, and were largely disintegrated; the large roots were not infected, but the lateral roots were discoloured. The chief symptom above ground was stunting. The condition was present only in soil recently planted to onions.

According to unpublished information supplied by E. J. Melhus from a thesis by W. A. Kreutzer (Host-parasite relationships in the pink-root disease of Onions. Thesis, Ames, Iowa, 1939) [cf. ibid., xix, p. 4], the host range of *P. terrestris* comprises barley, cane [? sweet sorghum], cantaloupe, carrot, cauliflower, maize, cucumber, eggplant, muskmelon, oats, pea, pepper [*Capsicum* (?) *annuum*], soybean, spinach, squash, tomato, and wheat.

Dunn (S.). **Rust causing injury to Ash trees in New Hampshire.**—*Plant Dis. Reptr*, xxiv, 19, p. 394, 1940. [Mimeographed.]

During the past two seasons ash trees in south-eastern New Hampshire, especially round Portsmouth, have been severely affected by rust (*Puccinia peridermiospora*) [*R.A.M.*, ii, p. 179] which in some instances has caused almost complete defoliation. The stage on the alternate host was found in *Spartina patens*.

Grant (T. J.) & Childs (T. W.). **Nectria canker of north-eastern hardwoods in relation to stand improvement.**—*J. For.*, xxxviii, 10, pp. 797–802, 1940.

Data on the incidence of *Nectria* cankers on north-eastern hard-

woods [*R.A.M.*, xviii, pp. 558, 827] were obtained from 75 widely separated $\frac{1}{10}$ acre-plots in New England, New Hampshire, and Vermont. Roughly one-third of the plots were canker-free, one-third showed 1 to 10 per cent. infection, and the remainder 11 to 80 per cent. Beech was free of cankers on some 80 per cent. of the plots on which it was represented and only slightly attacked on the rest; discrimination against this hardwood (not one of the 'useful' group) is therefore unnecessary from the standpoint of *Nectria* control. The so-called 'weed' hardwoods (aspen [*Populus tremula*], pin cherry [*Prunus pennsylvanica*], and mountain and striped maples [*Acer spicatum* and *A. pennsylvanicum*]) were no more frequently or severely cankered than the 'useful' sugar and red maples [*A. saccharum* and *A. rubrum*] and paper and yellow birches [*Betula papyrifera* and *B. lutea*], but their occurrence was significantly correlated (0·249 ± 0·109) with infection of the latter. The disease was more prevalent in pure than in mixed stands, and at high than at lower altitudes, the correlation in the latter case being 0·326 ± 0·104; injury by wind and sleet on the elevated sites is probably an important factor in the heavier incidence of cankers in such positions. Analyses of the data obtained in surveys of stops 15·2 ft. wide in four moderately to severely infected stands revealed a general tendency to greater susceptibility among yellow birches than the other 'useful' trees under observation. The differences between individuals in this respect, however, were so striking as to suggest inherent constitutional variations in reaction to the pathogen. Correlations between cankering and diameter at breast height ranged from positive (highly significant) to slightly negative.

Smucker (S. J.). **Apparent recovery of American Elms inoculated with Ceratostomella ulmi.** *Phytopathology*, xxx, 12, pp. 1052-1054, 1940.

Out of 115 small American elms (*Ulmus americana*) trees inoculated in 1936 with *Ceratostomella ulmi* at the Division of Forest Pathology, New Jersey, and contracting severe infection as a result, only three manifested any external symptoms in 1937 and one in 1938. In the remainder the number yielding viable cultures of the organism declined from 100 per cent. in January, 1937, to 73·2 in April, 1940, indicating that the apparent recovery of the infected trees was due neither to lack of pathogenicity of the fungus nor the acquisition of immunity by the host, but merely to the gradual dying-out of the inoculum [cf. *R.A.M.*, xix, p. 442].

Present status of the Dutch Elm disease.—*Plant Dis. Reptr.* xxiv, 17, pp. 349–350, 1 map (on p. 348), 1940. [Mimeographed.]

Between 9th and 23rd September 1939 Dutch elm disease (*Ceratostomella ulmi*) [*R.A.M.*, xix, pp. 124, 680] was found for the first time in south-eastern Chenango County, adjoining Broome County, New York, while additional infections were observed in Broome and Columbia Counties, New York, and Monroe County, Pennsylvania. In 1940 the infection area round New York harbour was extended into two further counties. In Connecticut the disease was found in four more towns in Litchfield County, and for the first time in two towns

in New Haven County and one in Fairfield County. A new outlying area of infection was noted in Luzerne County, Pennsylvania. Single trees were confirmed as infected in Delaware County, New York, and Susquehanna County, Pennsylvania, while another tree in Wayne County, Pennsylvania, may also prove to represent an extension of the same area.

KELSHEIMER (E. G.) & MAY (C.). **Prevalence of Elm dieback caused by Dothiorella ulmi.**—*Plant Dis. Reptr*, xxiv, 18, p. 370, 1940. [Mimeographed.]

A table is given [on p. 369] showing the relative prevalence of dieback (*Dothiorella ulmi*) [*R.A.M.*, xviii, p. 557] among the wilt diseases [unspecified] of elms during 1930 to 1938 in those parts of New York, Connecticut, New Jersey, Ohio, Maryland, Pennsylvania, Indiana, and West Virginia, in which scouting for Dutch elm disease [*Ceratostomella ulmi*: see preceding abstracts] has been carried out. The table records the presence of *D. ulmi* in 31 States, the District of Columbia, and Canada.

GRAVES (A. H.). **Breeding work toward the development of a timber type of blight-resistant Chestnut. Report for 1939.**—*Bull. Torrey bot. Cl.*, lxvii, 9, pp. 773–777, 1940.

Lists are given of the chestnut species, varieties, and hybrids grown in co-operative plantations in Connecticut and at the Brooklyn Botanic Garden in connexion with the project of breeding for resistance to blight (*Endothia parasitica*) [*R.A.M.*, xix, p. 569]. Notwithstanding the tendency of seedlings of *Castanea sativa* of European origin to die back in the winter and their susceptibility to the disease, an attempt is being made to incorporate this stock into the American material on account of its exceptionally vigorous habit of growth. Tests for resistance by inoculation (as described in the *Rep. nrth. Nut Gr. Ass., 1938*, p. 97) were not carried out in 1939.

FISHER (R. C.). **Studies of the biology of the death-watch beetle, Xestobium rufovillosum de G. III. Fungal decay in timber in relation to the occurrence and rate of development of the insect.**—*Ann. appl. Biol.*, xxvii, 4, pp. 545–557, 1940.

The results of experiments conducted at Princes Risborough under different conditions of temperature and humidity have led to the conclusion that although temperature and humidity have an important effect on the rate of development of the death-watch beetle, *Xestobium rufovillosum*, the factor finally determining the suitability of timber for infestation is the presence of fungal decay. It was found that oak and willow [*Salix*] wood and structural timber decayed by wood-destroying fungi (*Polyporus sulphureus* and *Fistulina hepatica* [*R.A.M.*, xix, p. 245] on oak, *P. fumosus*, *Polystictus versicolor*, *Trametes suaveolens*, *Coniophora cerebella* [*C. puteana*], and *Xylaria hypoxylon* on willow, and *Phellinus cryptarum* [see next abstract], *C. puteana*, *Merulius lacrymans*, *Polyporus sulphureus*, *Poria vaillantii*, *P. medulla-panis*, *F. hepatica*, and *Paecilomyces varioti* on timber) were more suitable for the larval development of the insect than sound wood. In decayed wood

and timber the progress of its attack was much more rapid, and there was some indication that an increased severity of fungal decay tended to shorten the duration of its life-cycle.

CAMPBELL (W. G.) & BRYANT (S. A.). **A chemical study of the bearing of decay by Phellinus cryptarum Karst. and other fungi on the destruction of wood by the death-watch beetle (Xestobium rufovillosum de G.)**—*Bio-chem. J.*, xxxiv, 10–11, pp. 1404–1414, 1940.

The effect of decay by *Phellinus cryptarum* Karst. on the chemical composition of oak sapwood [*R.A.M.*, xvi, p. 4] was studied in detail at the Forest Products Research Laboratory, Princes Risborough, and the results are here fully tabulated and discussed. The fungus was shown to cause a white rot of the class involving the simultaneous decomposition of all the major components of the wood. The maximum loss in weight from decay was estimated at 75 per cent., and the fact that at this stage the wood still contained lignin is considered to furnish conclusive proof that this constituent is not the sole source of fungal nourishment in the white rot group.

The data obtained from analyses of the frass of the death-watch beetle (*Xestobium rufovillosum*) [see preceding abstract] in 20 samples of infested oak yielded no evidence that any particular fungus predisposes the wood to invasion by the insect, the abundance of which in decayed material (mostly of the brown rot type) is further regarded as independent of the relative plenty or availability of any special food component resultant on fungal activity. It was found that, as the extent of fungal rotting of the substratum increases, the numerical value of the abstraction coefficient (defined as 'the wood digested by a group of insects when expressed as a percentage by weight of the wood disintegrated during boring by the same group') diminishes over the range of loss of 26 to 73 per cent. of the dry weight of original wood due to decay. Hence it is concluded that the primary function of the fungus in the biological succession does not lie in the chemical modification of the components of the wood in such a way as to facilitate their digestion by *X. rufovillosum*. On the other hand, the relatively better development of the beetles in rotted than in more or less sound wood is attributed to the depreciation in the mechanical strength of the former by the fungus, and its consequent inability to oppose effective resistance to boring by the larvae, the rate of which increases *pari passu* with the advance of fungal disintegration.

CHAPMAN (A. D.) & SCHEFFER (T. C.). **Effect of blue stain on specific gravity and strength of Southern Pine.**—*J. agric. Res.*, lxi, 2, pp. 125-133, 1940.

In tests conducted under controlled conditions with wood blocks, ¾ by ¾ by 10 in., of southern pine [*Pinus* spp.] inoculated with pure cultures of four species of the blue-staining fungi (*Ceratostomella pilifera, Graphium rigidum, C. pini*, and *C. ips*) the strength properties of the stained wood [*R.A.M.*, xix, p. 180] appeared generally lowered, but the reduction was significant only for toughness and work to maximum load, amounting to from 9 to 75 per cent. for the former and from 14 to 41 per cent. for the latter property. In only 6 tests out of 20 was the

specific gravity of the stained wood significantly lower than that of the controls. The four fungi did not attack the wood with equal severity and the same fungus did not have the greatest effect on all properties. There was some indication that the abundance of direct cell wall penetration by the fungi was broadly related to a reduction in toughness. The intensity of discoloration caused by these fungi may be indicative of the severity of attack for individual species but not for all species. The predominance of a particular staining fungus in a certain kind of wood does not necessarily indicate a greater harmful effect on the strength properties of this wood than that of a less prominent fungus. Staining tended to have a greater effect on heated wood than on unheated [ibid., xiii, p. 284]. Accumulated data indicate that blue stain, at least in unheated pine wood, reduces strength properties comparatively little, but the conditions favouring staining also favour decay fungi and hence it is often desirable to examine heavily stained material for signs of decay.

FINDLAY (W. P. K.). **Studies in the physiology of wood-destroying fungi. III. Progress of decay under natural and under controlled conditions.**—*Ann. Bot., Lond.*, N.S., iv, 16, pp. 701-712, 1 fig., 4 graphs, 1940.

In further studies on the physiology of wood-destroying fungi [cf. *R.A.M.*, xiii, pp. 485, 609] beech (*Fagus sylvatica*) samples were oven-dried, weighed, autoclaved, and placed on cultures of *Polystictus versicolor*, a white rot fungus, growing under moist conditions at 22° C. on 2 per cent. malt agar in special Kolle flasks. After 1, 2, 3, 6, 12, 18, and 24 months, the average loss of weight amounted to 7·4, 19·7, 26·2, 49·3, 75·7, 85·2, and 94·5 per cent., respectively, the maximum loss in any one sample being 99·4 per cent. Rate of loss of weight, after slight initial acceleration, remained more or less constant until about 75 per cent. of the original weight was lost, after which decomposition became retarded. This experiment shows that beech can be completely destroyed by a single species of fungus causing an active white rot. On the other hand brown-rotting fungi, e.g., *Coniophora cerebella* [*C. puteana*], *Merulius lacrymans*, or *Lenzites trabea*, which leave the lignin almost unaffected, do not remove more than about 70 per cent. of the wood substance and in an experiment with *Poria vaillantii*, another brown rot fungus, the average loss of weight of Scots pine [*Pinus sylvestris*] sapwood blocks after 24 months was only 55·5 per cent. The moisture content of the beech samples remained at about 50 per cent. of the over-dry weight for six months in the first experiment, and then began to rise, the curve representing the rise running roughly parallel with that for the loss in weight. It is evident that a much higher moisture content is required for fungal growth in badly decayed than in sound wood.

Investigation was next made of the effect of partial decay by a white rot fungus upon the liability of the wood to decay by a brown rot fungus, and vice versa. When sound beech blocks were exposed to *Polystictus versicolor* for four months, loss in weight averaged 40·9 per cent. but when the blocks were first decayed by the brown rotting *C. puteana* (26·8 per cent. loss) and then sterilized, loss from *P. versicolor*

averaged 50·6 per cent. *C. puteana* on sound wood caused 26·8 per cent. loss, and on wood first decayed by *P. versicolor* (40·9 per cent. loss) and then sterilized, 35·5 per cent. loss. In another experiment loss in dry weight after 8 months was 50·6 per cent. for *P. versicolor* alone, 30·9 per cent. for *C. puteana* alone (this figure being too low, as the samples had become too dry); 61·7 per cent. for wood exposed to *P. versicolor* for 4 months, sterilized, and exposed to *C. puteana*; 62·7 per cent. for treatment like the preceding but the *P. versicolor* not killed; 63·3 per cent. for wood exposed to *C. puteana* for 4 months, sterilized, and then exposed to *P. versicolor*; and 39·8 per cent. for treatment as the preceding but the *C. puteana* not killed. This result shows that when the first fungus was killed before inoculation with the second, total loss was about the same whichever acted first, but loss was smaller when wood containing living *C. puteana* was exposed to *P. versicolor* than when *C. puteana* was placed on wood with living *P. versicolor*.

Blocks of Scots pine sapwood rotted to various degrees by *Poria vaillantii* were then arranged in groups according to loss in weight and exposed for three months to attack by *Polystictus versicolor*. In the controls, not exposed to *Poria vaillantii*, loss due to *Polystictus versicolor* averaged 27 per cent. Where loss by *Poria vaillantii* amounted to not over 5 per cent., that by *Polystictus versicolor* was 14·7 per cent., this figure falling steadily with each increase in loss from *Poria vaillantii*, until it was only 3·6 per cent. for samples with 35 to 45 per cent. loss from *P. vaillantii*. It is evident that the removal by a brown rot of the cellulose in a coniferous wood renders the wood less suitable for subsequent attack by a white rot.

The evidence available suggests that it is true only to a limited extent to speak of a successional flora in the process of decomposition of a log. The first organisms to appear feed on the readily available food materials; next, true wood-rotting fungi develop, and if a white rot is induced, complete disintegration may be produced by a single species acting alone. Preliminary rotting by a white rot renders wood more susceptible to a brown rot. Wood slightly decayed by a brown rot is rotted by a white rot at least as rapidly as sound wood, but advanced brown rot is not often succeeded by a white rot.

Nakazima (Y.) & Suzuki (S.). **The rapid deterioration of copper-sulphate-impregnated poles and other related problems.**—Abs. in *Quart. J. Inst. elect. Commun. Engrs Japan, 1940*, 20, pp. 267–268, 1940.

The rapid deterioration of copper sulphate-impregnated poles in a district of Sendai, Japan, was found to be due to the properties of the local soil, the alternations of which between moisture and dryness caused excessive dissolution of the chemical. Poles impregnated with creosote by the Bessel process are the best suited to this type of ground. In the present method of preservation, uniformity of cross-sectional penetration is more important than the amount of copper sulphate per cu. in. absorbed, and there is reason to believe that adequate protection could be secured by the dilution of the treating solu-

tion to a density involving the deposit of 3 to 4 kg. copper sulphate, thoroughly and evenly distributed over the pole.

COOK (H. T.) & NUGENT (T. J.). **Truck crop investigations. The control of truck crop diseases in Tidewater, Virginia.**—*Bull. Va Truck Exp. Sta.* 104, pp. 1663–1717, 1 diag., 1941.

Directions are given in popular terms for the control, by cultural measures (including varietal selection) and chemical treatments, of a number of well-known diseases of asparagus, snap beans [*Phaseolus vulgaris*], Lima beans [*P. lunatus*], beets, celery, crucifers, cucurbits, eggplants, lettuce, onions, peas, peppers [*Capsicum* spp.], potatoes, spinach, sweet corn (maize), sweet potatoes, strawberries, and tomatoes. The bulletin also contains information on the etiology and control of vegetable diseases, as well as on the preparation and application of fungicides.

Annual Report of the (Gambia) Department of Agriculture, for the year ending 31st May, 1940.—8 pp., 1940.

On p. 4 of this report it is stated that the early planting of groundnuts and close spacing of the seed ensured comparative freedom from rosette [*R.A.M.*, xii, p. 5], no serious outbreaks of which occurred during the period under review.

O Cacaueiro e a "vassoura de bruxa". [Cacao and 'witches broom'.]—*Biológico*, vi, 10, p. 302, 1940.

In accordance with the provisions of article 29 of the (Brazilian) plant protection regulations of 12th April 1934, the territory of Acre and the States of Amazon and Pará are declared to be infested by witches' broom of cacao (*Marasmius perniciosus*) [*R.A.M.*, xvii, p. 801], and commerce in fresh seeds, fruits, and plants of cacao and related species of the Sterculiaceae between these regions and other States of the Brazilian Union or foreign countries is prohibited by an Order of 12th August 1940. Similar restrictions apply to soil, whether adhering to the above-mentioned plants or not, within the quarantine zone, all material destined for export from which must be grown in special fields under the supervision of the plant protection authorities and accompanied by certificates of freedom from disease.

Bundaberg-Childers Cane quarantine area. Amendment of Proclamation No. 5.—*Aust. Sug. J.*, xxxii, 8, p. 420, 1940.

Proclamation No. 5 of the Sugar Experiment Stations Acts, 1900 to 1938, originally issued in March 1939, and amended in the following July, by a new amendment dated 19th October 1940, prohibits (1) the removal (except for milling) of any sugar-cane from any farm in the Bundaberg-Childers area of Queensland on which Fiji disease [*R.A.M.*, xix, p. 116] or downy mildew [*Sclerospora sacchari*] has been found during the preceding three years; (2) the growing on any such farm of the varieties P.O.J. 213, 234, 2725, 2875, or 2878 beyond the third calendar year after that of planting, without a written permit from the Director; and the acceptance by mills for milling purposes of canes of the above-mentioned varieties, after the lapse of the prescribed period, unless the grower is in possession of a permit for their cultivation and removal.